Periodical

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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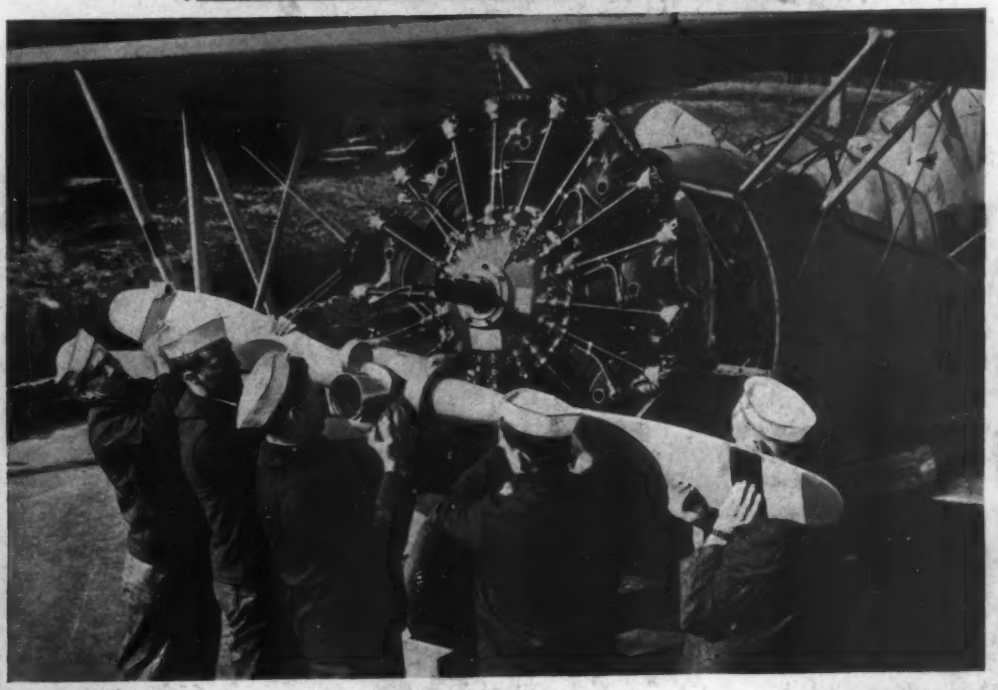


THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

Vocational education takes on the continuing responsibility for educating and training workers urgently needed on the production front

They need workers—and need them badly—on the production front of this fighting U. S. A.

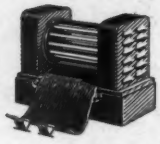
The job of vocational education is to get these workers into action—trained and ready to take their places on the production lines.

And vocational education is doing that job magnificently—in spite of fewer teachers, greatly expanded courses, and enrollments which have more than doubled in a year's time.

Helping many school shops and industrial arts teachers meet these additional assignments are Mimeograph duplicators. Classes in machine tool operation, welding, electricity, aircraft metalworking and all the rest require training bulletins, course outlines, and other materials quickly and easily produced through Mimeograph duplication.

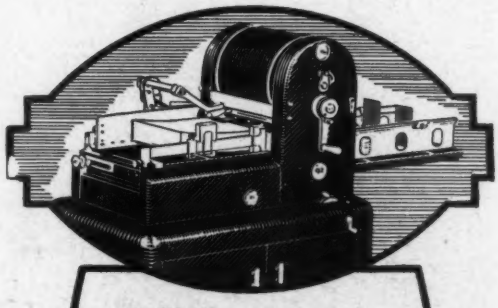
Larger classes become less burdensome. The teaching load is lightened. Instruction can remain individualized. Specialized text material, adapted to the needs of local industry, can be produced on the Mimeograph duplicator when textbooks are not available.

Make sure your Mimeograph equipment is doing all it can to help your school. Call the Mimeograph distributor in your community for assistance—or write A. B. Dick Company, Chicago.



Now obtainable without a preference rating —the Mimeograph photochemical printer

—Give every pupil his own copy of project drawings and other essential visual materials. The Mimeograph photochemical printer provides a new method of making duplicate copies of ink tracings, in quantity, at very low cost. Call the Mimeograph distributor nearest you for complete details.



Mimeograph duplicator

MIMEOGRAPH is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Patent Office.

FOR PRACTICAL TRAINING

Use the Lathes that Industry Uses!

TEACHING HELPS FOR SHOP CLASSES

South Bend teaching helps — books, sound films, wall charts and bulletins on the care and operation of lathes — are available for school shop instruction. Write for Bulletin No. 21-C.

★

13" swing, South Bend Quick Change Gear Lathe, with underneath motor drive. Available with accessory equipment for many special types of work.

For every new machine added to today's fast moving war production program, one or more additional operators must be available. And many more must be trained to take the places of those called for service with the armed forces. The need for men and women who are trained in the operation of modern machine tools was never more urgent.

With shop equipment that is the same as that used in Industry, new workers can be given practical training in the school shop. Being familiar with the tools of industry, they are better prepared to step into war plant jobs—ready to serve the Nation by helping to increase vital production.

Write for our new catalog No. 100B describing the various types of South Bend Lathes widely used in war production plants today.

South Bend Lathe Works

South Bend, Indiana Lathe Builders For 36 Years

ATKINS

Silver Steel SAWS

Helping the School Fill Industry's Need for Well-Trained Men

Trained workers—able to step into wartime jobs in a minimum of time—are industry's great need today. Using Atkins Silver Steel Saws in your manual training rooms can be a big help to you in filling that need. Correctly-designed by expert Atkins saw makers, these quality tools cut accurately, with a minimum of effort. There are types for every kind of sawing in wood, metal and plastics. Full information on the complete Atkins line is available on request.

Free to Manual Training Instructors—

NEW WALL CHART ON SAW FITTING

Teaching the fundamentals of fitting hand saws is greatly simplified with this new Atkins Chart. Illustrates and describes in detail the right way of filing and setting teeth of hand, rip and panel saws. Suitable for wall mounting —19" x 25" in size. Write for free copy.

E. C. ATKINS AND COMPANY
404 South Illinois Street, Indianapolis, Indiana

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"MACHINE-OF-THE-MONTH"

No. 11 UNIVERSAL SAW

Direct Gear Drive. Motor raises, lowers, tilts — table remains horizontal. Micrometer rip fence for fast set-ups and close work. Two mitre gauges, adjustable for accuracy and wear. Motors to 2 H.P.

Here's a variety saw with value *plus* — a precision unit for accurate work, with extra capacity for those hard-to-handle jobs.

It has power, speed, stamina. Blades up to 11" cut 4" deep. Cross-cutting capacity, 14". Ripping capacity, 12", 24", 36" or 48". Quality materials guarantee long, trouble-free service.

Write today for bulletins. We also manufacture high-grade bandsaws, jointers, cut-off saws, mortisers, lathes, shapers, grinders, glue pots, etc.

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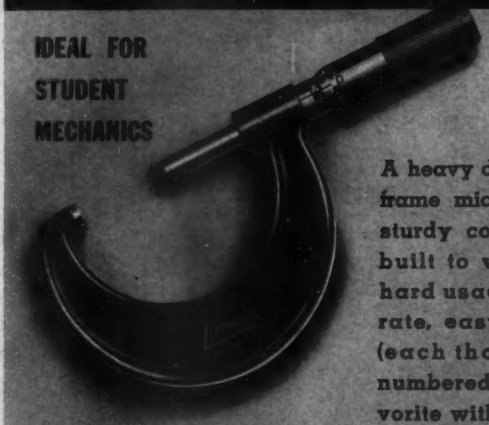
LUFKIN
MICROMETER No. 1911

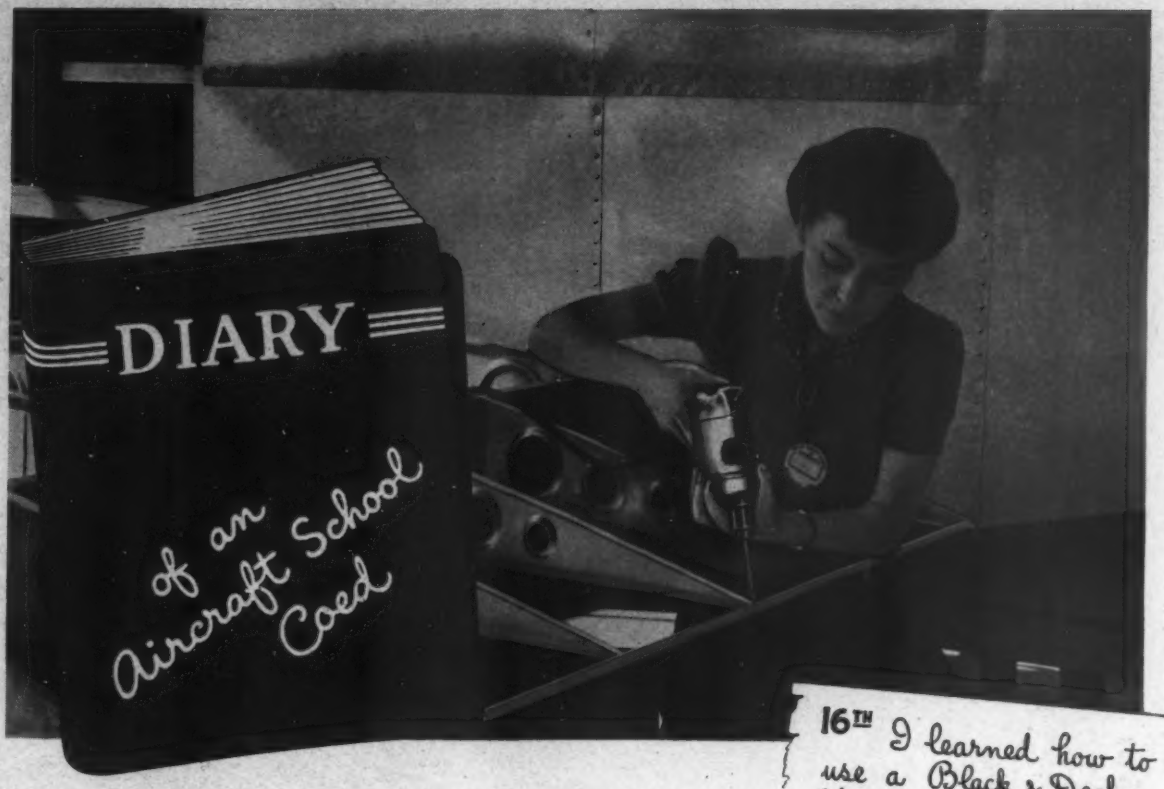
IDEAL FOR STUDENT MECHANICS



A heavy duty ribbed frame micrometer of sturdy construction built to withstand hard usage. Accurate, easy to read (each thousandth numbered). The favorite with industry and schools alike. Write for catalog.

"TEACH GOOD WORKMANSHIP WITH GOOD TOOLS"

LUFKIN
SAGINAW, MICHIGAN · NEW YORK CITY



16TH I learned how to use a Black & Decker Holgun -- it certainly is a sweet drill and so easy to handle.

17TH I'm getting my first chance to operate a Black & Decker Valve Grinder We're grinding valves for a P-38 plane engine. . . .

IF the women students at the Shelby County School of Aeronautics, Whitehaven, Tenn., kept diaries of their "school life"—the excerpts here would be typical of what they could write. Like hundreds of other industrial school "coeds" now preparing to take their places on America's humming war production lines, they're getting the feel of Black & Decker Portable Electric Tools in their training courses—the very same husky electric tools they'll most likely use when they "graduate" to war industry. Over 50% of the nation's war plants use Black & Decker Drills and Tappers, Nut Runners and Screw Drivers, Valve Grinders and Valve Refacers, Sanders and Portable Grinders somewhere in their production or maintenance facilities. Production experts know these tools do jobs faster and better.

That's why many industrial training schools and shops standardize on Black & Decker equipment. That's why we suggest you get in touch with your nearby Black & Decker Distributor for help in selecting the right tools for your training program.

Lessons in Ingenuity—FREE

If you haven't received our new booklet, "They Used Their Heads,"—showing how ingenious war producers have combined brains with B & D Tools to keep vital production rolling—write for your FREE copy today. Address: The Black & Decker Mfg. Co., 780 Pennsylvania Ave., Towson, Maryland.

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Black & Decker

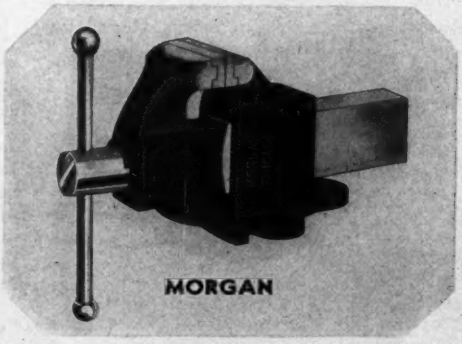
PORTABLE ELECTRIC TOOLS

Get in the Scrap with Your Scrap

Training For War Production
Requires GOOD TOOLS
Write for Catalog No. 34 showing STANLEY TOOLS for all School Shops . .
STANLEY TOOLS
FOR SHEET METAL SHOPS
Hammers, Chisels, Punches, etc.
FOR AUTOMOBILE SHOPS
Body and Fender Tools, Hammers, Chisels, Punches, Screw Drivers, etc.
FOR MACHINE SHOPS
Hammers, Rules, Chisels, Punches, Levels, etc.
FOR FORGE SHOPS
Anvil Tools, Tongs, Hammers, etc.
Visual Teaching Aids and Project Plans at cost.
STANLEY TOOLS
DIVISION OF THE STANLEY WORKS
Educational Dept., New Britain, Conn.
1843 STANLEY 1943
FOR WOODWORKING AND FARM SHOPS
The most complete line offered by one manufacturer.
FOR ELECTRICAL SHOPS
Hammers, Bit Braces, Bit Extensions, Screw Drivers, etc.

Train *with*

MORGAN VISES



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330 West 42nd Street **New York**

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, April, 1943, Volume 32, No. 4. Published monthly, except during July and August, by The Bruce Publishing Co., Milwaukee, Wis. Entered January 2, 1914, as Second-Class matter at Milwaukee, Wis., under Act of March 3, 1879. Subscriptions — U. S., $2.50 per year. Canada and Foreign, $3.00. Single copies, 35 cents.

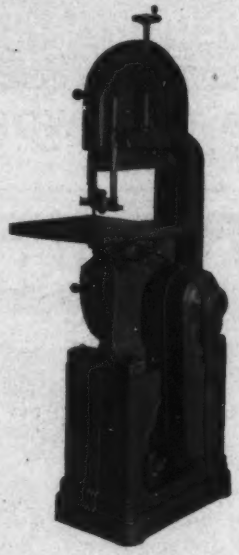
Vocational Teachers say:

"Give me safe machine tools"
"We want the same machine tools used in industry"
"Keep them simple in design"
"I need machine tools that can take a beating"

...They Find the Answers in walker-turner MACHINE TOOLS

20-INCH DRILL PRESSES

Power or hand feed. Drill to center of 20" circle. Feed 6". Capacity 1" in case iron, ¾" in steel. Spindle speeds 260-5200 r.p.m.

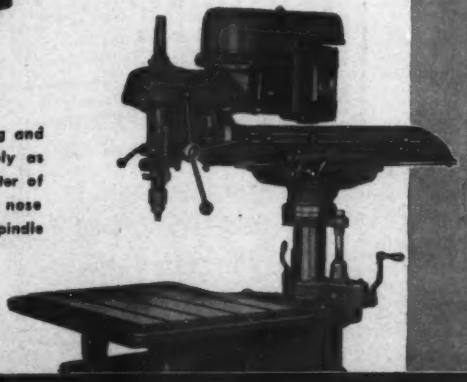


BAND SAWS

14 in. and 16 in. models. Back gearing and cone pulleys provide speed range from 61 to 5300 s.f.m. for cutting practically any material from steel to wood.

RADIAL DRILL

Handles light drilling, tapping and routing operations as effectively as larger machines. Drills to center of 62" circle. Maximum distance nose of chuck to table, 13½". Spindle traverse, 3¾".



Crowded classes, stepped-up schedules and less time for individual instruction call for careful selection of equipment for training purposes. Today—more than ever—you need machine tools that enable the student to learn without having the instructor "sitting on his shoulder" throughout every minute of the school day.

You'll find Walker-Turner Machine Tools the "right" units for this important task because their simplified design and easy operation necessitate less explanation. They stand up under inexperienced handling and are fully safeguarded to prevent accidents. Furthermore, these same Walker-Turner Machine Tools will be used by your students when they "graduate" into industry. Priced to fit school budgets, they are promptly available for war training. Send for new 1943 catalog.

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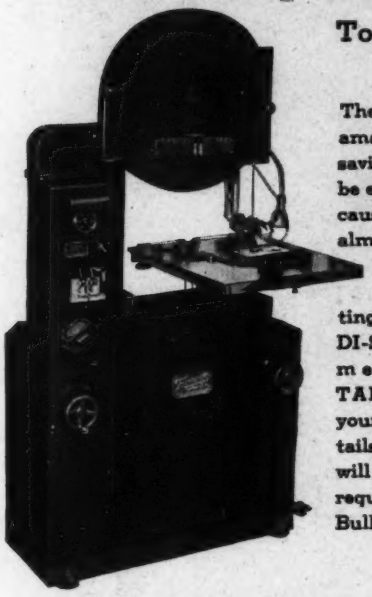
MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Tannewitz DI-SAWS

are ESSENTIAL to Teaching MODERN Tool & Die Making



The innumerable and truly amazing time and money-saving shortcuts which may be effected by DI-SAWING is causing this equipment to be almost universally adopted by the leading shops. For inside and outside cutting, filing and polishing the DI-SAW is obsoleting other methods. Put the TANNEWITZ DI-SAW on your MUST list. Complete details of this exellent machine will be sent you promptly on request. Just ask for DI-SAW Bulletin.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

BURRILL'S
Paramount Band Saws

Your students should be provided with *BAND SAW BLADES* which have been adopted as being able to stand the stiff requirements of War Production Plants.

Accurately made Band Saws of extreme toughness enables more work to be produced in less man hours.

All sizes are carried in stock for prompt shipment.

Exclusive Band Saw Manufacturers.

PARAMOUNT SWEDISH BANDS
ACCURATELY SPACED TEETH
NO CRUSHED POINTS - GUARANTEED

BURRILL SAW & TOOL WORKS
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VOCATIONAL TRAINING

No. 100-24-DS
Open Frame Shop Bench

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Our men in the front lines have the finest fighting equipment. The men behind the men at the front, those in industry engaged in the war effort, must also have the finest equipment. Sheldon vocational tables and shop benches, proved by over 40 years of experience, are the very finest obtainable. They are being used in civil and armed force training schools throughout the country.

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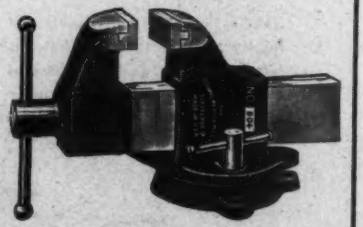
INDUSTRY'S FIRST CHOICE FOR OVER THIRTY YEARS

Columbian Continuous screw Woodworker's vises are furnished with hard wood handles—or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.

The complete line of Columbian Vises is designed to excel in its field—all are made to the same high standard of engineering and workmanship. A vise for every need and purpose.



Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

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THE WORLD'S LARGEST MAKERS OF VISES

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• America's busiest war plants prefer SKILSAW TOOLS . . . so they prefer new workers trained with SKILSAW TOOLS. They know students reach peak production *sooner* when taught with the tools and methods of industry itself.

SKILSAW TOOLS are lighter, more compact, more powerful. That's why they're such favorites in aircraft, tank and war plants everywhere. Ask your dealer for a convincing demonstration of SKILSAW TOOLS *today!*

SEND FOR THIS FREE CATALOG!
It illustrates every tool in the SKILSAW *line. Then ask your dealer to demonstrate these tools on the jobs you teach.*

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SKILSAW BELT SANDERS (Below) do all sanding and "final-finishing" easier, better, 10 times faster. Light, perfectly balanced. 4 MODELS

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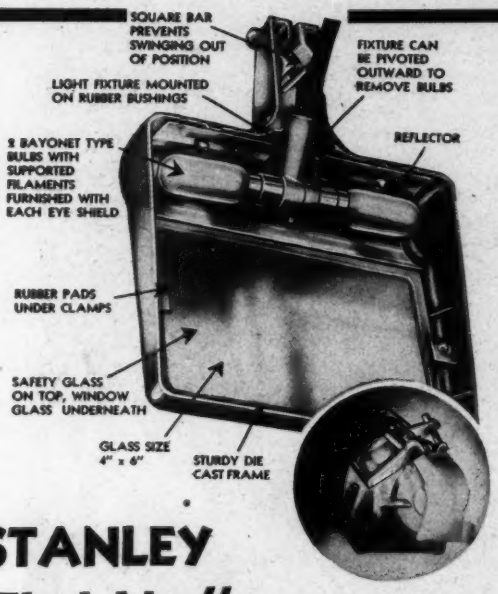
PROTECT STUDENTS' EYES FROM GRINDING HAZARDS!


SQUARE BAR PREVENTS SWINGING OUT OF POSITION
FIXTURE CAN BE PIVOTED OUTWARD TO REMOVE BULBS
LIGHT FIXTURE MOUNTED ON RUBBER BUSHINGS
REFLECTOR
2 BAYONET TYPE BULBS WITH SUPPORTED FILAMENTS FURNISHED WITH EACH EYE SHIELD
RUBBER PADS UNDER CLAMPS
SAFETY GLASS ON TOP, WINDOW GLASS UNDERNEATH
GLASS SIZE 4" x 6"
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Gives positive eye protection with excellent light directly on the work. Adjustable up and down for standing or sitting position. Cannot be moved to non-guarding position without dismantling. Can be easily applied on bench or belt-driven grinders. Write for details. Stanley Electric Tool Div., The Stanley Works, 112 Elm Street, New Britain, Conn.

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Teach with the tools actually used in industry.

With ARMSTRONG TOOL HOLDERS—used in over 96% of the Machine Shops and Tool Rooms. Develop "tool sense" and a love for fine tools with ARMSTRONG Drop Forged WRENCHES—Carbon and Chrome-Vanadium Steel Open End Wrenches; Box Socket and Detachable Socket Wrenches with improved designs, better balance, finer machining and finish. Set up jobs with modern, safe ARMSTRONG Drop Forged Setting-Up Tools. Use ARMSTRONG Drop Forged Clamps that never slip, spring or spread, and ARMSTRONG Drop Forged Lathe Dogs that are standard everywhere.

Write for Cutter Grinding Charts and new O-39 Catalog. Sent to Instructors upon request.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
322 N. Francisco Ave., Chicago, U. S. A.
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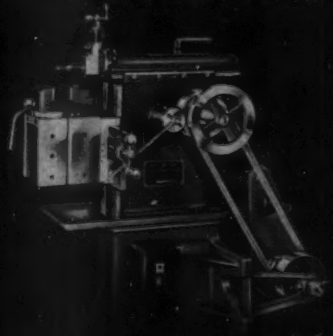
RHODES
7" HORIZONTAL SHAPER
3½" VERTICAL SLOTTER



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TO A SHAPER OR SLOTTER IN 15 MINUTES!

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BUY WAR BONDS

Atlas F-SERIES 10" LATHES

FOR SCREW MACHINE WORK

EQUIPPED WITH turret attachments and lever type collet chuck.

TOOL UP for WAR PRODUCTION

Throughout the nation, machine tool training schools are adding to their already great contribution to the victory program by tooling up for subcontract work on small parts — turning students into efficient production workers in their own shops!

Atlas equipment is ideal for this job. Atlas machines are easy to operate and permit alert students to master the fundamentals quickly for valuable production work. In addition, Atlas tools require a relatively small investment. Their compactness, the fact that they are mass-produced by the latest precision methods, and their practical engineering makes them low in cost, high in accuracy, long in working life.

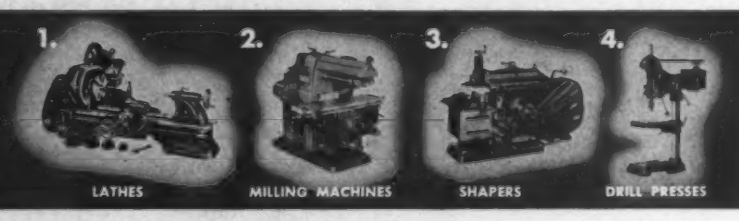
If you already have Atlas Lathes, you know their performance value. With very little change — the addition of tailstock and carriage turrets and lever-type collet chucks — you can convert your Atlas Lathes into precision hand screw machines. Write today for complete information about the Atlas 4 tool team for small-part machining. Atlas Press Company, 471 North Pitcher Street, Kalamazoo, Michigan.

ARMY E NAVY

Atlas

ATLAS PRESS CO.

Atlas 4 TOOL TEAM FOR SMALL-PART MACHINING



When the School Shop goes on Shifts . . .

TOOL QUALITY STANDS OUT.

As you train more and more youngsters and former clerical and office workers in the crafts of production, real *quality* in your training tools stands out. As your shop goes on shifts, and crowds a year of training into short weeks, your Millers Falls tools *prove* themselves a worthwhile investment. For the *more nearly* school conditions approach those of the plants and factories where most Millers Falls tools are used, the *more evident* become the benefits that good design, good materials, and good production craftsmanship put into Millers Falls equipment.

GET DETAILS. You'll find the easy-handling, trouble-free service of Millers Falls tools worth investigating. Catalog, sent free on request, shows the Millers Falls hand tools, portable electric tools, hack saw blades, and precision tools in the current line.

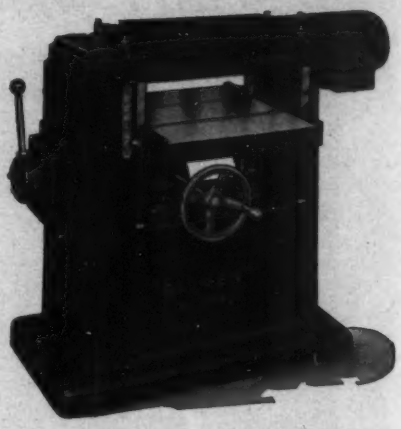
MILLERS FALLS TOOLS
SINCE 1868

MILLERS FALLS COMPANY GREENFIELD, MASS.

Train for War Production

ON THE

No. 399 SINGLE SURFACE PLANER



This machine has one-piece base assuring permanent alignment of parts . . . Heavy roller-bearing safety-type cylinder and three high-speed knives . . . Takes stock to 18" wide, 6" thick, short as 8½" when fed singly . . . Precision built to deliver top performance for years to come.

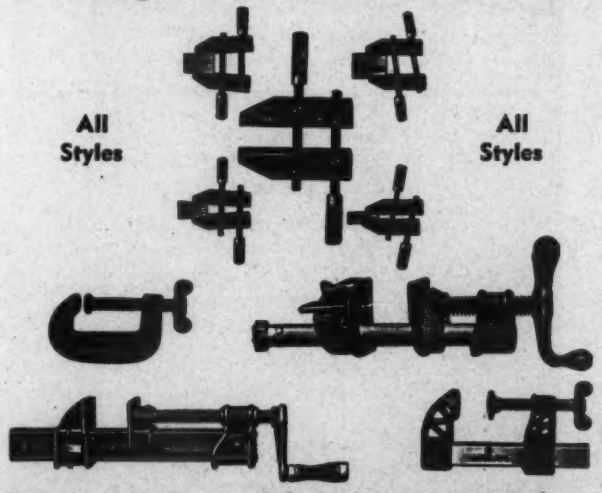
The list of Junior Woodworking Machines includes: 18" Band Saw, Boring Machine, 7" Saw Bench, Oilstone Tool Grinder, Speed Lathe, Mortiser, 18" Surfacer, 6" Jointer, Wood Trimmer, Shaper, Vises, Belt Sander, Desk Sander.

Write for descriptive literature on any of the "Oliver" high quality machines.

Oliver Machinery Company
Grand Rapids, Michigan, U. S. A.

It Pays to Use the Best

All Styles



All Styles

Designed and built to stand the hard every day grind of production work and improved from time to time, with the assistance of some of the largest industrial users. HARGRAVE TESTED CLAMPS have been the leaders in this field since 1879. They cost no more than ordinary clamps.

IN STOCK AT YOUR SUPPLY HOUSE

CATALOG showing our complete line of Clamps, Chisels, Punches, Bench Anvils, Saw Vises and other tools for the SCHOOL SHOP will be mailed to you upon request.

THE CINCINNATI TOOL CO.
Waverly and Main Aves. Cincinnati, Ohio

War Workers know these tools...

HOW ABOUT YOUR STUDENTS?

WAR plants working with wood and metal are finding many uses today for these Carborundum-made products. Skilled workers have come to depend on their fast-cutting qualities and durability to produce the smooth, uniform finishes required in precision work.

When your students enter war work, they too will be called upon to use these tools. Are they getting advance experience in handling them? Let your students learn with the tools with which they'll earn. Give these abrasive "Weapons for Production" a place in your curriculum now.

1. FLINT PAPER. For ordinary sanding, particularly on softer woods Carborundum Brand Flint Paper is ideal. A superior grade pure flint uniformly coated on the best grade backing. Sharp, fast-cutting, durable. Standard quire packages, Handipac cartons or rolls.

2. EMERY CLOTH. Carborundum Brand Emery Cloth is made of the finest emery. Often preferred for metal finishing where polish is more important than the amount of cut. Standard quire packages or rolls.

3. ALOXITE CLOTH. Aloxite Brand Aluminum Oxide Coated Abrasives are widely used throughout industry for the removal of surface irregularities. Indispensable for metal finishing, removing rust, fitting metal parts, cleaning up for brazing. Sheets in standard quire packages.

4. ECONOMY ROLLS. Aloxite Brand Aluminum Oxide Cloth in a handy, easy-to-use form. Available in 1, 1½ and 2-inch widths on wood spools. Operator simply cuts off a piece of width desired. Saves time and waste. Ideal for polishing steel in a lathe.

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ABRASIVE PRODUCTS

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REG. U. S. PAT. OFF.

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Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company)

Keeping Pace with Industry

is a not-too-easy problem now—even for people in industry.

To give your students the best possible training in the use of coated abrasives, provide them with materials made to Industry's specifications:

For Sanding Metal:

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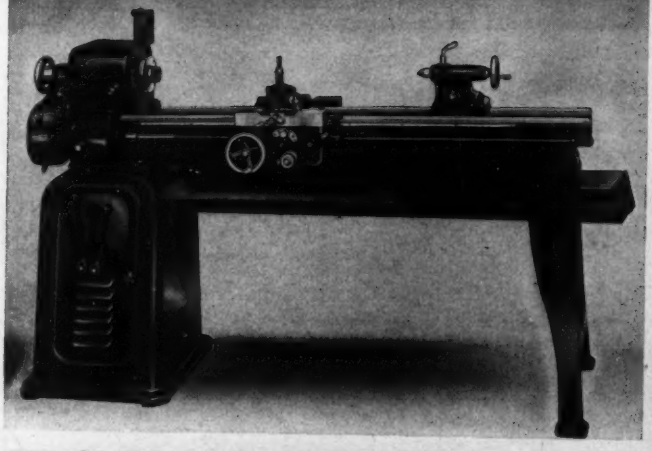

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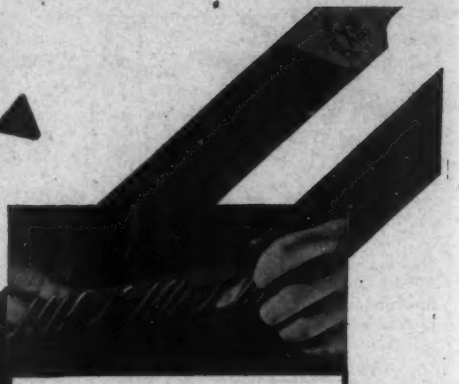

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOL. 32 APRIL, 1943 Number 4

IN THIS ISSUE

This issue presents a number of very interesting articles to its readers.

So much has been heard about the Navy training school on the Navy Pier at Chicago, that everyone will want to read what Lt. Comdr. Charles C. Caveny has to say about it.

Einar E. Siro's article on tests deserves special attention, as do the articles by Dalton and Jay, Halsall, Sotzin, Karch, King, and Freeman.

The tests by Miller, and Glenn, and the article by Gard will be interesting and helpful to many, and the articles by Hastie, Worthington, Barocci, and Toloczko will be found exceedingly worth while.

All of the articles under Problems and Projects deserve a very careful examination. They have been specially selected, because they are well fitted for the limitations put upon school shops by these times.

THIS MONTH'S COVER

The cover picture chosen for this issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION illustrates in a striking manner how very definitely and practically our men in the armed forces are trained for the duties which they are to encounter in their fight for our rights and our lives.

Photograph, courtesy of the United States Navy.

THINGS TO REMEMBER

- The Red Cross Drive during the month of March.
- The need for more blood donations for our men in the armed forces.
- The 1943 Easter seal sale from March 26 to April 25, sponsored by the National Society for Crippled Children.
- The need to buy U. S. Bonds and Stamps.

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Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright 1942, by The Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

Subscription Information. — Subscription price, $2.50 per year, payable in advance. Canadian postage, 50 cents; Foreign Countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents. Notice for discontinuance of subscriptions must reach Publication Office in Milwaukee at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

PUBLISHED MONTHLY, EXCEPT DURING JULY AND AUGUST, BY THE BRUCE PUBLISHING COMPANY, 540 N. MILWAUKEE STREET, MILWAUKEE, WISCONSIN

Eastern Office: 330 W. 42nd. St., New York, N. Y. — Western Office: 66 E. South Water St., Chicago, Ill.

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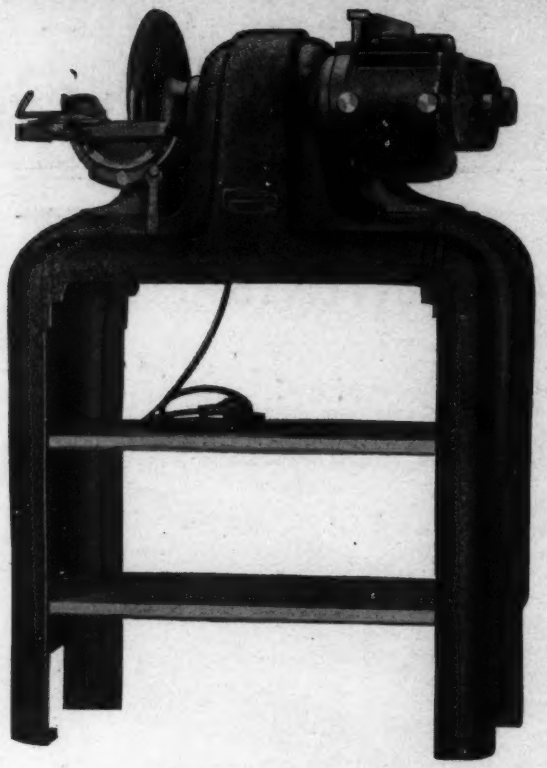

W-90 95 SANDER

VICTORIES on the battlefront often have their beginnings on the production lines at home. Thousands of the new workers that industry needs to produce materials of war receive their training on school shop machines. It is vitally important, therefore, to utilize these machines to their best advantage . . . to keep them in the best operating condition.

For instance, it is highly advisable to replace the discs and belts on this sander when they are badly worn. Greater pressure is required because of their decreased cutting ability, and the load on the motor is increased considerably. The task of changing sanding discs on the disc sander is greatly simplified by the use of one of the newer adhesives.

It is also important that the proper type of abrasive be selected for the work at hand. Garnet should be used only for wood, while electric furnace abrasives are generally preferred for metal finishing, although they can also be used on wood.

The belt sander unit is equipped with a very sensitive tracking device which should be carefully adjusted to keep the belt in perfect alignment. Avoid excessive tightness as it imposes a heavy starting load on the motor.

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Short Talks on Wood

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Balsa is used extensively for rafts, floats, life preservers, buoys, and bilge keel filling. Also used in aircraft construction, model plane building, thermal and vibration insulation, in the manufacture of water sports equipment and in many other applications where lightness is a prime requisite.

Most of the world's supply is obtained from Ecuador although the range extends from the West Indies and Central America to Bolivia. A tropical jungle tree requiring rich soil, much moisture, continuous warmth and good drainage. Very rapid in growth.

The tree is tall, generally straight and has a large, round head. Resembles the North American cottonwood in appearance. Reaches a diameter of about 30 inches and a height of about 60 feet in 8 years. Trees under 10 years produce the lightest and most desirable wood.

The bark is mottled gray and white, smooth, and quite handsome. The grape-like leaves on the smaller trees are enormous in size, some being as much as 4 feet across. They grow smaller as the tree matures until they measure about 10 inches across. The fruit is a cylindrical pod about 8 inches long containing downed seeds about the size and shape of a grape seed.

To date, forty-three brief articles similar to the one above and dealing with the more commonly used woods have appeared in these ads. As in the past, we continue to invite your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

Training Schools on Navy Pier, Chicago

LT. COMDR. CHARLES C. CAVENY*

Chicago, the educational capital of the middle west, is today the location of one of the nation's largest naval training activities. Housed on Navy Pier, this school was established by the Navy Department in the summer of 1941, and the first classes were opened to enlisted men on December 1 of that year. In less than five months, the pier was converted from a commercial and recreational structure, owned and operated by the city of Chicago, into an "anchored ship" on which thousands of men are housed, fed, and trained as aviation and Diesel-engine mechanics.

The trainees who come aboard the pier may hail from any of the 48 states. Most of them have gone to high school, a few hold college degrees, all have attained a satisfactory score on a mental ability and a mechanical aptitude test. Their backgrounds are varied. There are English, French, Germans, Poles, Italians, Czechoslovakians — but they are all Americans. There are Protestants, Catholics, Jews, Christian Scientists, and Mormons. There are carpenters, painters, machinists, electricians, plumbers, typists, clerks, masons, roofers, teachers, musicians — representatives of each of the hundreds of trades, crafts, and skills that constitute the occupations of the country.

The main objective of the educational department of this Naval Aviation Technical Training Center and Naval Training School (Diesel) is the training of enlisted men as aviation and Diesel-engine mechanics for the war effort. Secondarily, the skills gained will be of great value in postwar reconstruction when skilled aviation and Diesel-engine mechanics will be in demand. The courses, therefore, have been organized to meet the practical problems which are likely to be encountered in the field. Primary emphasis is placed on the educational program to insure competency in the many duties which aviation and Diesel-engine mechanics will be called upon to perform. At the same time, however, the military phase plays no small part in the total schedule, and Navy fitness, indoctrination, gunnery, or signaling is included in each day's activities.

*Educational Officer, Navy Pier, Chicago, Ill.

Administrative Organization

The Naval Aviation Technical Training Center and Naval Training School (Diesel) on Navy Pier is under the command of Captain E. A. Wolleson, USN (Ret.). He is a native of Illinois, having been born in Belleville. Captain Wolleson was appointed to the United States Naval Academy at Annapolis from Illinois and was graduated in 1906. On January 20, 1942, about two months after the school had been opened, Captain Wolleson assumed command.

The planning and establishment of the school took place while Captain Wolleson was Chief of Staff, Ninth Naval District, with Headquarters at Great Lakes, Ill. Lieutenant Commander Charles C. Caveny, USNR, the educational officer, was at the time Director of Vocational Education for

Instrument and hand-tool shop — Photographs, courtesy of United States Navy

National Defense Training in the state of Illinois. Captain O. F. Hesler, USNR, district training officer for the Ninth Naval District, and Captain E. T. Short, USN, of the bureau of personnel, were representatives of the Navy who served in the early stages of the planning and development of this school. Mr. James B. McCahey, president of the board of education of the city of Chicago, rendered valuable service and played an important part in securing Navy Pier from the city authorities through the office of Mayor Edward J. Kelly.

The educational department is composed of a staff of administrative officers and civilians to whom specific phases of the work are delegated by the educational

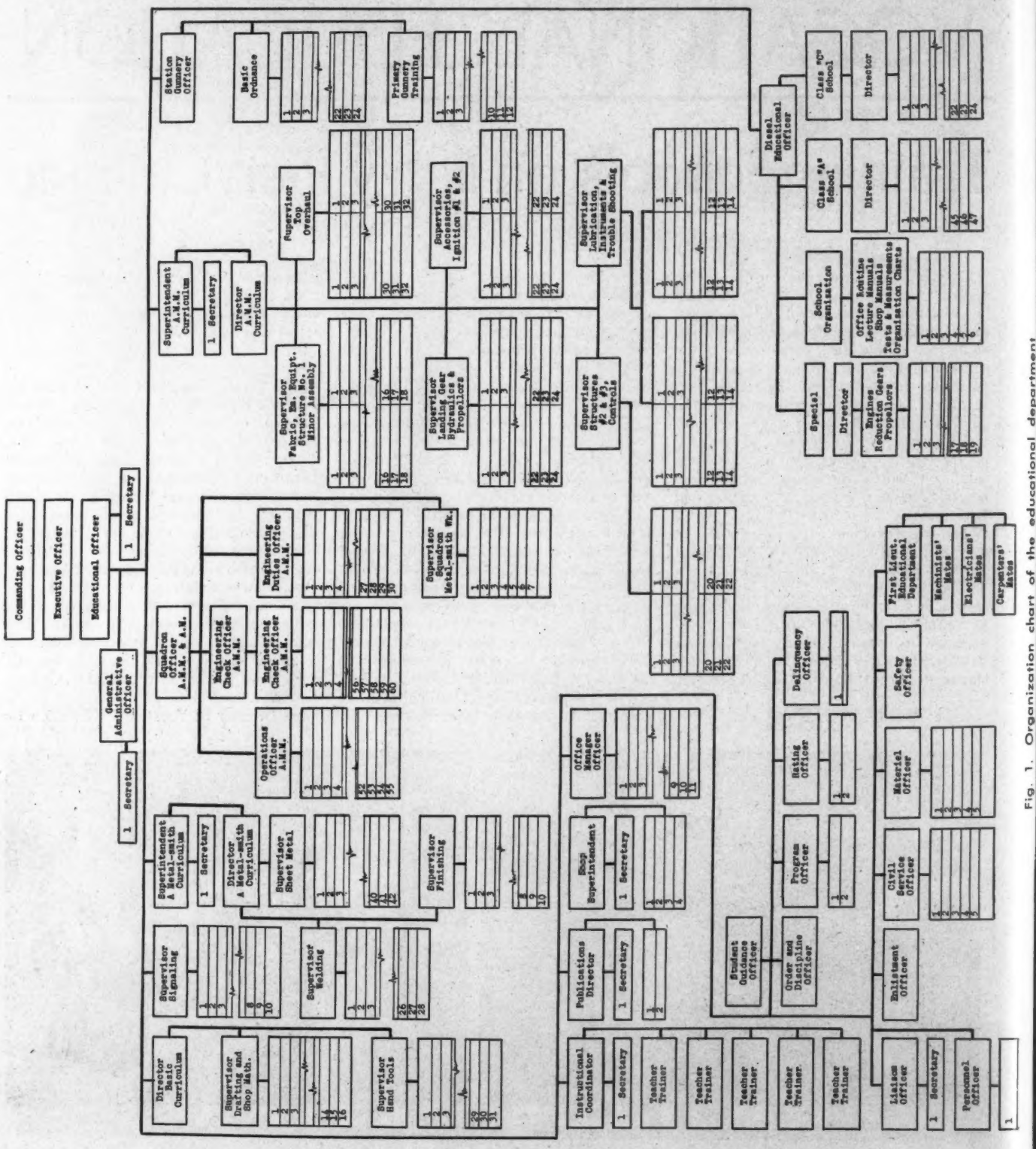


Fig. 1. Organization chart of the educational department

officer. These positions are indicated in Figure 1, which shows the organization chart of the educational department.

To facilitate the work of the various school units, three divisions have been established: publications director, instructional co-ordinator, and shop superintendent. The publications director is responsible for the editing and publishing of all educational department literature and for such instructional materials as audio-visual aids, the technical library, and the testing program. The upgrading of instruction in the school is the function of the instructional co-ordinator; and, in addition, it is his responsibility to carry out a program of teacher training. The shop superintendent is an assistant to the educational officer and his duties are primarily shop planning and engineering.

The superintendents of curriculums are responsible to the educational officer for all activities relating to their particular courses. The faculty, composed of enlisted men and civilians, is responsible for the teaching of specialized courses in the various fields.

The great number of men under training at any one time has resulted in the development of mass-production techniques in the school schedule. A new company of trainees enters the course of instruction every week and each company in the school moves forward to a new phase in assembly line fashion. At the end of each week, too, one group completes its work and is graduated.

Sickness and emergency leaves do not break the trainee's progress, thus preventing him from completing his work in the allotted time and from graduating with his company. A night school program has been instituted under the direction of Lieutenant J. W. Thomas, USNR, student guidance officer, which provides make-up classes for those trainees who have fallen behind. The shops are open and instructors are provided to direct the practical work, as well as the related work of the classroom.

Lt. Comdr. C. C. Caveny, U.S.N.R. Educational Officer

THE EDUCATIONAL OFFICER

Lieutenant Commander Charles C. Caveny, USNR, reported aboard Navy Pier, Chicago, as the Officer in Charge of the Educational Department in April, 1942. He is entrusted with the important task of molding raw sailors into highly efficient mechanics. Mr. Caveny is a veteran of the first World War, having spent 27 months in Europe where he participated in five major battles. He enlisted in July, 1917, immediately after completing his freshman year in college.

Lieutenant Commander Caveny served an electrical apprenticeship and worked as a mechanic for the Pennsylvania Railroad. After his discharge from the Army, he attended the Engineering School of the University of Pittsburgh and the Carnegie Institute of Technology under the Vocational Rehabilitation Plan of the Veterans' Bureau. He received his degree in electrical engineering and earned graduate degrees in industrial education at the Pennsylvania State College. Mr. Caveny has been elected to membership in A.I.E.E., Phi Delta Kappa, and Iota Lambda Sigma.

Mr. Caveny's school career has included every possible phase of teaching from classroom and shop instructor to professor of engineering. He is assistant professor of vocational teacher education at the Pennsylvania State College and is now on military leave. He has served as teacher in several cities, as vocational director of the Altoona, Pa., school district, and as Pennsylvania state supervisor of vocational education. He was borrowed by the United States Office of Education to serve as special agent for the north central region.

The advent of the national emergency again prompted the United States Office of Education to seek the services of a man with Mr. Caveny's experience for the very important office of director of vocational education for National Defense Training in the state of Illinois. While serving in this capacity, and previous to his appointment as Lieutenant Commander in the Naval Reserve, Mr. Caveny worked with the Navy department in planning its extensive training program.

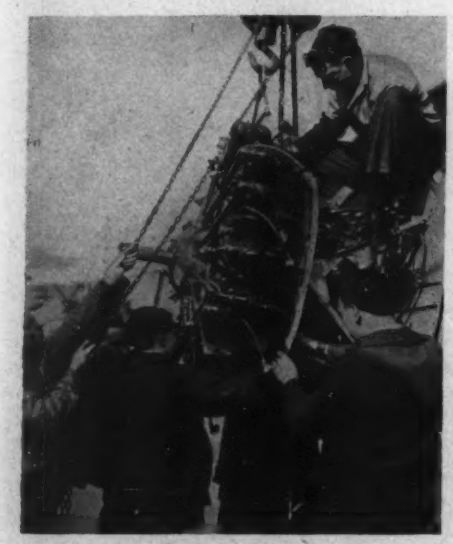
Courses of Study

When a trainee reports to this activity following his initial training at "boot" camp, he is assigned to one of two aviation courses, both Class A, or introductory. If he completes his work satisfactorily — and every effort is expended by his company commander and chief petty officer, by the officers of the educational department, and the teaching staff to see that he does — he may be rated as third-class aviation machinist's mate or as a third-class aviation metalsmith. Some men of the incoming draft will be assigned to the Diesel-engine operation and maintenance course, and they may be rated as second-class motor machinist's mate, or as fireman first or fireman second class. In order to qualify for any of these ratings, trainees — known as "Macs" — must satisfy the requirements, outlined in the manuals of the bureau of personnel, maintain a high scholastic average, and observe the regulations of this station.

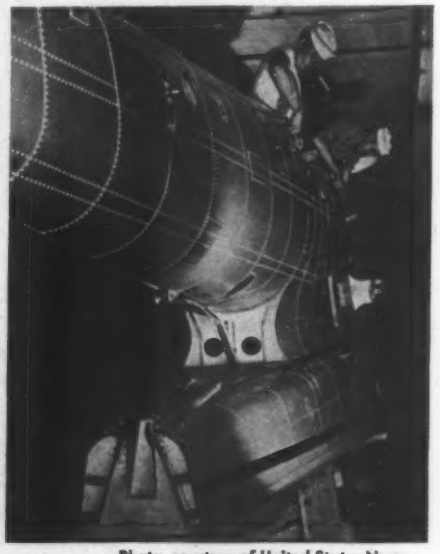
Let us suppose that Chet Ciembronowicz, apprentice seaman, is assigned to the aviation machinist's mate curriculum. He will first take a basic course designed to provide him with the necessary background for accurate layout work in the shops through an integrated program of blueprint reading, sketching, drawing, and mathematics. He will spend four hours a day in the hand-tools shop, where the correct use of those tools essential to aircraft maintenance are taught, and one hour in class covering related information.

Upon completion of the basic phase, which is similar for both machinist's mates and metalsmiths, Chet will begin his specialized work in aviation mechanics. There are three phases: airplanes, engines, and squadron operations. During the several weeks of the first phase, Chet will learn to inspect, care for, and maintain the multitudinous units that make up the modern aircraft. He will study fabrics, controls, instruments, landing gear, hydraulics, accessories, and emergency equipment; and he will work on the airplane structure itself.

The engine aspect, which involves the disassembly, cleaning, inspection, minor repair, reassembly, and adjustment of the



— Photo, courtesy of United States Navy
Mounting the engine



— Photo, courtesy of United States Navy
Sheet-metal work

Fig. 1. Organization chart of the educational department

power plant, will provide Chet with much of the information he will need to "keep 'em flying."

The proving ground for the effectiveness of Chet's work in shops and classes is provided in squadron operations. Here he is given much practical experience in actual aircraft servicing. He will prepare a plane for flight by starting, running up, and stopping engines. He will learn to handle the plane on the ground and to service it by both ship and shore methods, make careful engine checks, and inspect, care for, and maintain the various planes on the line in accordance with official bureau-of-aeronautics daily and thirty-hour flight inspection forms.

The primary qualification for both the aviation machinist's mate and the aviation metalsmith is a deep sense of personal responsibility. Any careless work that he may do on an aircraft might well lead to disastrous results. For this reason, special attention is paid to safety factors in all courses taught at this activity, and constant viligance is maintained to inculcate in every trainee habits of conscientious and careful workmanship.

A trainee pursuing the aviation-metalsmith course is programmed for the course in sheet metal upon completion of the basic phase. Here he will work on a number of projects designed to develop the skills and procedures necessary for inspection and maintenance of metal aircraft. He must be able to repair and rebuild damaged parts involving designed features of planes. A general knowledge of the sheet metals used in airplane construction will be taught in related class, and experience with tools and equipment will be provided in shop.

— Photo, courtesy of United States Navy

Trouble shooting

Bernie Austin, for example, who is assigned to this curriculum on the basis of aptitude tests and previous experience, will be taught to make repairs on floats, fuselages, gas tanks, cowlings, skins, and other metal parts of airplanes. An important part of his work will be concerned with the stretching and shrinking of aluminum. Every trainee is required to attain a high degree of efficiency in layout work, and in the fabrication and assembly of all parts of wings, fuselages, and movable controls.

During the welding phase, Bernie will practice welds on sheet and cast metals. When he has mastered the fundamentals and has become skillful in handling his equipment, he will be given work on aircraft fuselages and the aluminum parts amenable to this process.

Metal spraying, sand blasting, electroplating, and forging will be taught in the metal finishing phase. In shop and class, Bernie will learn how to temper airplane fittings and the heat-treating processes employed for various metals used in aircraft construction and repair.

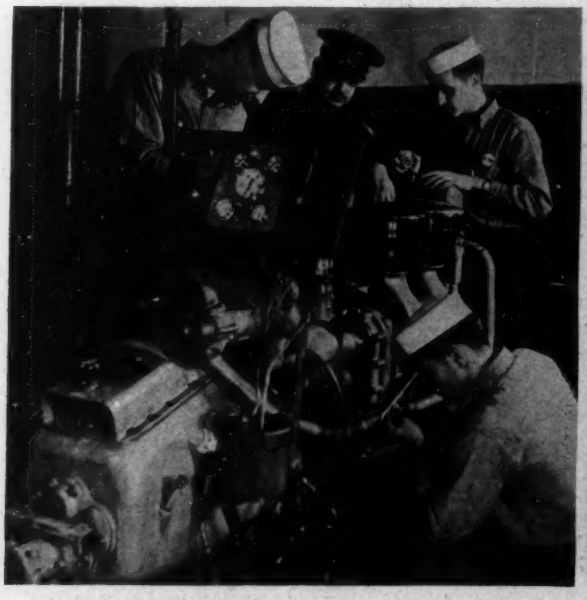
The aviation metalsmith is given a program of work in squadron operations, too. This part of the course is designed to provide practical experience in the inspection, care, and maintenance of metal airplanes. He is taught the methods for ship and shore procedures, and his responsibilities in cooperation with the machinist's mate are emphasized.

The Naval Training School (Diesel) is divided into two classes, A and C. Trainees in the A curriculum study those phases of Diesel-engine operation and maintenance applied to marine propulsion units, their auxiliaries and accessories. Trainees in the C school take more advanced and specialized training.

The trainees' school day in all courses requires a four-hour shop period in addition to class instruction. The shopwork gives practical experience and every effort is made to provide not only type, but real, situations that might confront the airplane and Diesel-engine mechanic.

The shops are equipped with widely diversified *live* units, and the work is designed to stimulate as nearly as possible the operation and maintenance procedures encountered following the training period.

Physical fitness is a daily feature of each bluejacket's program and the gymnasium, recently opened for use, is nightly the scene of an extensive intramural schedule. Movies and stage shows are held each evening in the auditorium. Sunday is devoted to recreation, and divine services are held for the several denominations.



The Diesel shop

— Photographs, courtesy of United States Navy

Chet and Bernie and their shipmates look forward to graduation and the granting of their petty officer ratings. The ceremonies take on special significance in the lives of these men, who, having spent some months aboard the pier, are about to prove their mettle in the field. A typical program includes music by the pier band, the invocation by one of the station chaplains, remarks by the commanding officer, and the distribution of certificates. Frequently famous visitors address the graduates. Secretary of the Navy, Frank Knox, told the graduates recently, "All of you have just finished an intensive training course. You have developed a skill that will not only contribute greatly to our ultimate victory, but will be of the utmost value after the war is won when the demand for skill will be greater than ever before." Thus Mr. Knox epitomized the twofold mission of this school.

— Photo, courtesy of United States Navy
Welding shop

Instructional Aids

To streamline and make the program more effective, a great number of instructional aids have been developed on Navy Pier. Instructor's manuals containing classroom topics and shopwork jobs have been prepared for most of the courses and work is proceeding rapidly on the manuals for the entire program. These manuals were prepared by the faculty of the school and organized by the instructional coordinator and his staff of teacher trainers. The manuals for teachers' use set forth, in accordance with Naval specifications, the subject matter of the various units and suggest the manner in which much of the material may be effectively presented. *The Teacher and His Job*, a handbook for instructors, has been published in mimeographed form to assist the teachers with information and suggestions pertinent to sound educational practice.

As in all naval centers and training schools, much use is made of motion pictures, slide films, charts, mock ups, cutaways and other audio-visual aids. The films employed at this activity are supplied by the bureaus of the Navy and cover all aspects of the work being taught in classes and shops. Guides for effective use of film strips have been prepared for many of the films to insure uniformity of presentation.

Most of the charts, models, mock ups, and cutaways used for instructional purposes were prepared by the shop teachers at this station. These devices assist the trainee in visualizing the various units in their relationship to the assembled airplane. Display boards, illustrating the several steps in the fabrication of sheet-metal objects and welding procedures give the aviation metalsmith a complete picture of what he is expected to accomplish. Some visual aids have been supplied by the special devices department of the bureau of aeronautics; others have been obtained from manufacturers; and still others from the Museum Extension Service of the Works Progress Administration. Instructors throughout the school are encouraged to employ all aids that meet Navy specifications and that are of use in making the trainees' work as meaningful as possible.

A technical library is being assembled for the use of instructors and students and will be of considerable value in upgrading instruction and in stimulating the instructors to greater effort in keeping up with recent developments in their fields.

Educational Research

A program of standardized, comprehensive tests has been set up under the direction of the publication director. The test forms are rapidly replacing the instructors' individually prepared weekly quizzes. They follow the official courses of study and have great educational value for students in terms of approved material. It is not intended, of course, that the instructors coach the trainees that they may do well on the centrally prepared examinations. Results show, however, that uniform presentation of material and the realization that machine scoring will be completely objective serves as a great incentive to trainees and outweighs the advantages which might obtain from a program of individually prepared examinations.

The mission of Naval Aviation Technical Training Centers and of Naval Training schools throughout the country is to train thoroughly, in the shortest possible time, skilled workers for the war effort. At Navy Pier, the most recent findings of vocational educators have been incorporated into the training program. In order to advance the caliber of the instruction offered, several educational investigations are being made. It is believed that these may lead to further refinements in teaching techniques and in the selection of trainees. It is also expected that the results of these investigations may have considerable value for education in general and for vocational education in particular. The Naval training programs are performing meritorious service, not only for the war effort, but also for the entire educational profession. The influence of the various schools and technical training centers is certain to be felt in the educational philosophy and practice of the future.

— Photo, courtesy of United States Navy
Students at welding

The Vocational Outlook in Wartime and After

FRANK W. DALTON* and JOHN JAY**

In July, 1940, the public vocational schools of this country gave quick and decisive evidence that they were ready to meet emergency defense and war-production training needs. Almost overnight the vocational schools, operating on a peacetime basis and for peacetime industrial pursuits, reorganized their programs. Classes at all hours of the day and night for all types of men and women have been organized to meet increasing war-production demands. Many modifications of policy and practices were promptly made to meet war-production training conditions.

The extent of the program thus developed has been made possible because of conscious attention on the part of the states and local communities during the past 25 years to the development of trained personnel and the provision of adequate buildings and equipment. All of the above is evidence that the vocational schools are war conscious and ready and willing to make still further modifications and adjustments to meet new war emergencies.

For immediate war-production purposes many skilled operations usually requiring skilled craftsmen or operators have been broken down into a series of operations. For these operations workers are being specifically trained in relatively short war-production training programs.

While emphasizing these short-term training programs because of the immediate and pressing need, the regular programs (Smith-Hughes and George-Deen) for the training and development of initial specific skills for the skilled trades must not be neglected. Both of these programs are essential to the war-production effort.

The retraining of workers dislocated from non-defense industries is a tremendous and pressing need in certain areas. The public vocational schools are exerting every effort to meet this need to the entire capacity of the schools. This capacity is being expanded where necessary.

The vocational schools are extending this program and retraining on short notice wherever tools and housing can be provided for the purpose. This program is now being expanded to the extent of carrying the training into industry for the purpose of utilizing more of the facilities of industry itself in a war-production training program.

Within the past six or seven months, a complete inventory of school training facilities has been made, so that all vocational school equipment can be used to capacity and every training station which will contribute to training for wartime production shall be in total use.

All machine tools and other equipment suitable for war-production training now used for industrial arts in junior and senior high schools and colleges are being made available. Idle equipment, like idle men, must be put to work. A definite program has been outlined in this state for the training of women, and this training is adjusted to occupational needs and opportunities. It is expected that a greater need for women trained for war-production industries will appear as the labor shortage involved in the progress of the war preparations becomes more acute.

Vocational school equipment and personnel are now in use in Michigan in many instances on a 7-day week, 24-hour day basis for war-production training purposes.

Let us cite just a few instances of the magnitude of this war-training program as far as this state is concerned. Since July 8, 1940, over 150,000 men have been trained in our vocational schools for specific employment, and additional thousands have been trained in industrial shops as a result of educational administration. Recent information indicates that the government will request that 4,000,000 more workers be trained in the United States. So there still remains much to do.

The estimated amount of electrodes or welding rods necessary to carry on the training in the welding shops alone is approximately two 45-car train loads. This will give some idea of the supply problem.

The training of personnel to do the teaching and necessary administrative work has had to go on simultaneously with the rest of the program.

The purchase and installation of equipment needed to supplement meager facilities in certain areas has presented a major problem.

However, to attempt to discuss the problems involved would require more time than we have under the present circumstances.

Perhaps it would be well to say a few words regarding other phases of the program. In rural areas provisions have been made for training out-of-school farm youth and adults to help man the "Food for Freedom" agricultural war-production program. These provisions include an extension of the present courses in operation, maintenance, and repair of farm machinery and the addition of courses to assist in the increased production of various farm products.

The home-economics training services of our schools are being extended to provide information and training for both in-school and out-of-school groups in the conservation of food, clothing, and other critical supplies; nutrition, including the use of substitutes for scarce foods; and the adjustment of home budgets to wartime economy.

Training for business occupations must keep pace with specific needs developing from newly created demands of war production for additional personnel in this field.

War-production vocational training has a definite relationship to war labor supply and war production, and is proceeding in accordance with uniform policies for labor supply and training established by the war-production board. These policies include a provision that labor requirements for war production in industry and agriculture will have first priority. They also include provision for (1) full utilization of the local labor supply previous to inmigration; (2) provision for full utilization of minority groups in war industries; (3) selection of trainees for pre-employment training courses and types of courses on the basis of the needs of war production, confining training to the specific jobs reporting a known present or future need; (4) provision for extension of the employment of women in increasing numbers, particularly in areas where shortages of male workers are occurring; (5) provision for consideration by employers to qualified workers displaced as a result of government-authorized curtailment of raw materials or civilian production, or other government action; (6) provision that existing seniority and related work rates of workers transferred to war production will be maintained with the company in which they were originally employed; (7) the U. S. Employment Service is designated as the agency for supervision of labor recruitment; and (8) maximum use of the best skill of employed workers and

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use of appropriate agencies by employers to assist in job analysis and employee training.

Both the war-production vocational training and the long-range vocational programs are under the direction of the U. S. Office of Education, with the additional assistance and direction of the special defense training authorities, and operate through the state boards for vocational education and local boards.

Obviously, in our effort to provide trained men and women for the war industries, we should not lose sight of our needs of the long-range vocational program for our youth. Adults are now being taken care of and with proper foresight and planning will not be lost sight of at the close of the war. A good program of vocational education has been developed in this state; it needs to be continued, fostered, and expanded and under no circumstances allowed to deteriorate, for educational leadership is brought face to face with the stark question: What can and should the schools do to meet the unemployment that disturbs and baffles youth, to supply the vocational guidance appropriate to the tempo and characteristics of rapidly changing machine industries and to familiarize pupils with the realities of the stern scene in front of them? This is not a question involving the mere routine of adjustment. It is a call for creative and constructive thought and action in education . . . any conception of education that ignores this critical situation is false to its trust. An adequate long-range program of vocational education is at least one of the answers to this moot question. Fortunately, those responsible for vocational education in Michigan recognize these facts and the regular program of vocational education is moving forward without more than the usual hazards that might be expected under present circumstances.

Let us pause here to consider some of the things of which educators must be fully mindful: First, since the war has made many new demands upon the school, it will continue to do so. Second, that farsightedness of postwar considerations is most commendable.

Third, free things will become increasingly more difficult to obtain — we must produce more efficiently. The efficient producer will be the one to inherit the earth.

Fourth, men will be the central figure in an industrial civilization. We must train toward the highest conception of leadership. Thus adult education must be considered on a much broader scale from now on.

Fifth, the need to develop war machines — and organizations — into machines and organizations for reconstruction.

Sixth, we have a dual job not only to supply our fighters with the munitions of war, but to preserve that for which they are fighting.

Seventh, remember the "lost generation" of the depression years — children of jazz, "jitterbugs," and similar names. That American youth had gone to the dogs, nearly everyone agreed. But please remember those were the boys who were at Wake, Guam, Marshall Islands, Bataan — those are the boys who are doing the actual fighting in this war.

Eighth, a quality generation has been produced to fight; it is just as essential for the schools to provide a quality generation for the problems of victory. While vocational education is the immediate need and will continue to have a prominent place in our general education program, it is essential that we keep a balance. We must not only train to win the war but train for why we should win and keep peace.

Ninth, the ideals of democracy must be protected against war hazards, and intelligent loyalty to American democracy must be strengthened.

Yet after all, "It is a foul wind which blows no good." Out of all the evil, the chaos, the bloodshed, the perversion of higher human purposes and ideals in this war, much good may come: "May" come, because if the same shortsightedness and procrastination which characterized the prewar preparedness period were to perpetrate the same degree of folly in the solution of postwar problems, even victory, in the larger sense, might yield us only the fruits of defeat.

The blasts of war have shattered leisurely progress in all fields, including education. Dire necessity has cast economy to the winds, and time itself has usurged the throne of planned and orderly production. Where defeat and death are the only other alternatives, time rules with the hand of a heavy taskmaster, and many a blunder must be forgiven in the name of necessity!

Nevertheless much good can come from it all. Much good has already come. If the lessons learned in winning the war can be applied in the winning of the peace, we may yet enter into the most prosperous era that this nation, or any other has ever seen. We need only to review the experiences concerning new developments in industry, and many now contemplated, to be assured that already much valuable progress has been made.

The old physical principle, the law of the conservation of energy, that energy may change in form, or be dissipated, but never lost, holds relatively true in the social realm.

The tremendous amounts of energy expended in reorganization, in specialization, and in specific adjustment and adaptation to war schedules need not necessarily be lost. However, it is becoming increasingly apparent that the system for readjustment, and readaptation after the war is over, will require just as elaborate a mobilization of resources, if the problems of peace are to be solved as successfully as those of war.

Education, and especially vocational education, which must bear an essential part of postwar readjustment, must lay its plans for peace far in advance or be caught in the chaotic swirl of the usual political and economic postwar letdown.

It is hardly necessary to point out that war develops conditions of extreme abnormality in all walks of life, that the most violent dislocations are in the vocational field. Hence it should not prove totally unexpected if the postwar reactionary readjustment in the vocational field should approach a status of violent social maladjustment. In fact, it is practically certain to do so, unless adequate anticipatory steps are taken to forestall it.

We might as well face the fact that labor, today, is not the labor of father's or grandfather's day. Due to the efforts of a universal education which has approached nearer to the goal of universality than ever before in history, labor is not the ignorant, unthinking, heterogeneous mass that it was. While there is still in the makeup of the ranks considerable to be desired, yet it is a much more enlightened, awake, critical, and jealously alert body of humanity. That labor will drop into the lap of the general public a very fine kettle of problems when this war is over, is a foregone conclusion. The rumblings of that yet far-distant storm can already be heard in the skeptical reception accorded in those instances where it has been necessary to throw large numbers of men into special labor classifications where the "prerogatives" of labor see the need for considerable limitation in normal times. And again the brunt of the burden of solution will fall upon the shoulders of the program of education and, more specifically, vocational education.

In other words, unless we can see our way clear for an economy that will absorb the abnormal personnel of wartime into the same peacetime classifications, we have a problem on our hands that only the sharpest of foresighted planning can forestall. The problem of ten tool-and-die men, for example, for each postwar tool-and-die job, is typical of the myriad problems that will demand solution in the field of labor relations alone.

Among other problems on the labor front, the urgency of the situation, especially the time element, naturally gives tremendous impetus to the creation of time saving devices, particularly in the field of automatic machinery. This movement is as necessary to the war effort as vaccine is to a smallpox epidemic, but it will leave as its aftermath a scar on the

body politic. In other words, unless inventive ingenuity creates *new* fields of endeavor, *new* demands for products, *new* methods for the distribution of available labor over the field of total available production, and adjusts both to the needs of possible total consumption, a social disorganization of major proportions may result from this quarter alone.

While the present war effort absorbs the grand total of production, this problem will not arise. Now, every man displaced by automatic production is a man released to make a blow in the right direction. We are forced to supply a world engaged in an artificial consumption of goods at present — millions of tons for Davy Jones' locker . . . millions of tons more for destruction! When the American productive system finds itself again faced with a normal world of normal consumption, however, then the specter of redistribution of the four vital factors shall confront us. Only well-planned, long-range measures can possibly create the new balances then needed among (1) raw materials, (2) labor, (3) capital, and (4) consumption.

We need not share the views of those who expect a major depression to follow the war, however. Far from it! Let us review the degree of parallel between the two World Wars:

In the first place, World War I was a sideshow in destruction compared to this war. Destruction was largely confined to the areas adjacent to the battle fronts. Destruction was not necessarily a prime objective on the civilian front, and the machines of destruction were juvenile compared to those operating now. Today, destructive efficiency has reached a point of magical efficiency, operating over areas of millions of square miles, far behind the *fronts*. The entire tempo, both of destruction and production has been stepped up, and with it the tempo of the problems engendered both during and after the war.

Next, let us recall that a period of 11 years passed, between November 11, 1918, and October, 1929, before the *big crash* was precipitated. During those 11 years (with the exception of the minor 1921 "change-over regression") the geared-up American production machine was rebuilding the destruction wrought by World War I. However, by 1929, the rehabilitated areas had *caught up* with the situation and had become not *markets*, but *competitors* in the world market for American goods. American production, geared to a rate that could supply the demands of a convalescent world, found itself obliged to recede into the normal channels of a world again producing fairly adequately for itself.

Had we planned effectively for the readjustment? Had we taken steps to soften the shock, to reallocate the four vital factors? No. We took one look at the stock ticker, jumped thrice into the air, and collapsed into the isolated imbecility which helped to bring about the conditions for another world war.

If it took 11 years to recover from the destruction of World War I, how long will America enjoy unparalleled prosperity building up the destruction caused by World War II?

One person's guess is as good as another's but 15 years should be conservative; that is, allowing for increased efficiency partially counterbalancing the vastly increased destruction. Then, we shall be forced to meet the issue squarely, if we have not previously provided for it.

In the meanwhile, we have a war to win, or all of this speculation and preventive medicine shall be but as the breath of flowers cast upon the desert air. Today, time and destruction rule the world, and dominate all policies. It is in the ghastly government of these two that we all must function if we are to even survive for our wrestling match with postwar problems.

First, we must immediately train every available person for every immediate need, in the order of the urgency of that need. This is being done with increasing efficiency.

Second, we must disregard even the best interests of the individual for the best interests of the nation. This, too, is being done, for "When the devil drives, we needs must."

Third, we must endeavor to our utmost to establish a long-term policy in which the best interests of the individual will eventually be harmonized with the supreme interests of the nation, both during the war and after, in order that the problems resulting will not be of such intensity as to make our victory a hollow one.

The principal social problem, during the war and for some time after, is vocational.

And that vocational problem will be one largely concerned with adjustment and adaptation for the two great change-overs: *to* war production and *from* war production. *To* war production is definitely on its way. The *after* war-adjustment problem could possibly be simplified by:

1. Adopting what might be termed a dual-objective education — giving every individual at least *two strings to his bow*.

2. Providing a far broader, deeper, and elongated *general education* background for all vocational pursuits, for if the vocational *specialization* is the roof on the house it is far more feasible to put on a new roof than to rebuild the whole house.

3. Providing facilities, financial and otherwise, so that *every* teacher will become a *vocational guidance adviser* to at least the following suggested extent:

   a) Comparable to a travel bureau agent who can direct and inform one of what to expect along any particular road, including many he has never traversed himself.

   b) Comparable to a good librarian who while she could not possibly be familiar with the detailed contents of all her volumes, yet knows instantly where to locate any given detail; who synthesized advisory information for those who wish to specialize.

4. Working in closer harmony with all institutions having parallel purposes, without prejudice or political bias. Among these probably one of the most effectual will be the labor organizations.

5. Bringing the government to the realization that even emergencies do not make a specialist of a layman by the simple expedient of giving him a title, and that the forces of education's trained guidance personnel must be utilized to the full in completely co-ordinated harmony with government activity.

6. Greatly expanding the *open-door policy* of higher education to those who find the need for some specific course in some university, but also find themselves barred by entrance or other requirements. This applies especially to vocational education.

7. Greatly increasing and emphasizing adult education in general.

8. Placing special emphasis and attention on secondary education as the group most likely to be highly specialized in fields which will require the most vigorous readaptation.

9. Providing whatever legislation is necessary to facilitate the foregoing program on a national scale.

The obviousness of the necessity of fitting square pegs into square holes is one of the best things to have come out of this war thus far. If its carry-over can be applied to postwar conditions, guidance will come into its own.

Sincere appreciation of educational war efforts has already been expressed by both government and army men, and this *foot in the door* advantage of lay appreciation should not be allowed to fade out.

All in all, this is the glorious moment for vocational education and its apostles. We stand on the threshold of an opportunity to serve in a capacity which should result in achievements worthy of the gratitudes of a mighty nation. But at no time should we lose sight of the vital necessity of maintaining a balance in our educational efforts. A broad basic educational background upon which an adequate occupational program can be developed is fundamental.

Behind the roar of artillery, the throb of high-flying planes, the rumbling crash of tanks, the earthquaking blast of bombs, the white water path of the torpedo, the churning swirl of the fighting ship, the staccato of machine-gun fire — behind *every* manipulation of twentieth-century mechanized military force stands the man at the machine.

In this fight it is not only the man at

the machine on the fighting front hurling his blazing mental notes in battle's wild, weird symphony of death, but the man who defies the foe as he stands at his workbench or lathe and toils steadily with his hands regardless of threatened air attacks, or sabotage, or disgruntled fellow workers.

Force, for the present, is master of world destiny. Military power is the *master* power. Mechanized supremacy is *the key* to military power. Skilled production is in turn the key to *mechanized supremacy;* and, in the last analysis, the key to ultimate supremacy in skilled production is the backlog of vocational training, whether *in* school or *out*.

Behind the man at the machine, then, stands the vocational instructor — the man behind the man behind the man behind the gun!

When human hands are engaged in carrying out the will of human minds, we have production; but when *highly skilled* human hands carry out the will of *highly trained* human minds, then we have production at its highest *point of perfection*. Nothing less will suffice!

This is a war of the *survival of the fittest*. This is a war avowedly *to the finish*. *Perfected* mechanized force is our immediate objective. Our ultimate objective is to bring that force to bear upon the enemy, victoriously.

Therefore, vocational instructors and students of the machines that make the machines of war have a right to be proud of their job. For if there is any logic in this mad world, their hands upon the lever of their machines are also upon the hilt of the naked sword poised at Axis hearts on the field of battle!

Machine-Shop Training for Women

FREDERICK HALSALL*

As the available supply of trainable men for machine-shop work is rapidly being exhausted and the draft age is lowered, industry has as in World War I, turned to women with initial machine-shop training to replace the men taken into the armed forces and to fill the many new openings created by the all-out effort. If the government, as reports indicate, is going to increase the army to seven and a half million men and industry is going to absorb five and a half million additional workers next year, then women must be trained to fill the gap. Already there is a distinct lack of man power especially in the machine trades.

In the oganization of a pre-employment course for women for the first class, entrance requirements should be kept as high as possible, and as the supply decreases they can be gradually lowered.

The interviewing and testing should be done tactfully and without hurrying. Potential trainees are usually eager to answer questions; however, most of them come without any previous mechanical experience and are usually a bit dubious about their ability to handle the training. They need encouragement and it can be pointed out that women in other countries and localities are doing machine operation jobs formerly done by men. It should be impressed upon the trainee that the first ten days is a probationary period, and that if she does not show sufficient aptitude for the work she will be dropped from the class. If the applicant is married it is good practice to find out if the husband has been consulted about the training, and if possible, he should be there during the interview.

Physical requirements asked by industry pertaining to height, age, weight, and marital status, should be considered when enrolling the applicant. Obviously, if industry wanted single women or those within certain weight and age limits it would be useless to train any who did not fulfill the qualifications, at least until you had satisfied the local demand.

The mechanical aptitude test should be administered quietly and without confusion, and the potential trainee made to feel at ease. It should be explained that the test is only part of the criteria upon which selection is based, the other factors being general appearance, employability, and a tryout period of ten days in the shop. If the person does not measure up in the tryout period, the school will be doing her a favor by excluding her from further training.

The group should be brought together on the opening day, and the rules and regulations pertaining to the use of the school building — turning out lights, lunch hour, and the like — should be explained by someone in authority. Each trainee should also receive a copy of these rules and regulations in printed form. If no lunchroom is near, the trainees should be made to carry their lunches, particularly if the shift is from 11:00 p.m. to 7:00 a.m. Articles taken from current magazines and papers can be used to illustrate the proper dress for shopwork.

It should be impressed upon the trainees that they are a group working together, and that they should be pleasant and help each other. This will help to lessen the tension in the shop and more nearly parallel industrial conditions.

The instructor should be on guard against showing any favoritism. Women are quick to note these things and will develop petty jealousies and attitudes, which if not curbed, can react to the detriment of the class. Female trainees are more responsive to criticism or praise than are men. A little praise now and then from someone in authority will work wonders for class morale, as will one or two placements in a leading industry. Generally speaking, we found that our first group of women were more enthusiastic than the last group of men; they worked harder and were more eager to learn.

An enthusiastic and hard-working instructor is a distinct asset to any class. He should be patient and understanding, competent, and show an interest in each trainee. Nothing is more deadening than a disinterested teacher.

The trend in industry is toward the replacement of men with women, and the schools should do their part by helping to train for this. At present, any small district where vocational education is a part of the general high school program can, with careful interviewing and preselection methods, recruit an excellent eight-hour pre-employment class for women.

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GUIDANCE

He isn't sure of where to go,
Or what he ought to do;
There's many a thing he'd like to try
Though his skills are few,
And lest someone lends him a hand
To guide him on his way,
We may have one more problem child
Whose keep we all must pay.

So why not take a little time
To sit down with him now,
And find out what he likes to do,
And where he lives, and how?
For there's a place for everyone,
Plus a job that he can do,
If a friend would only show the way;
That friend might well be you.

— *Leonard E. Schmidt,* Lincoln Hall Vocational Shops, Lincolndale, N. Y.

A Comparison of Industrial Arts and Vocational Education

HEBER A. SOTZIN*

Many pupils, teachers, patrons, and laymen have difficulty in differentiating between the programs of industrial arts and vocational education in our public schools. This is true, particularly, at present, when attention is focused so strongly toward the war effort and technical training in our vocational schools. The principal reason is due, probably, to the fact that in many instances the same tools, processes, and materials are employed in both fields. The aims and objectives are dissimilar. To clarify the situation, the following may be helpful:

Industrial arts is that part of general education concerned with satisfying man's innate desire to construct with concrete materials and the development of an intelligent understanding of our modern industrial civilization and the problems which have resulted from it, through contacts and experiences with a wide variety of industrial products, manipulative experiences, and tools of manufacture.

Its function in the total school program is an integral part of general education. It occupies the same relationship to the school's curriculum as the areas which comprise social studies, health activities, language studies, fine arts, etc. It does not attempt to develop skills to earn a livelihood or to train a pupil for a job. This function belongs to another field of education known as vocational education.

Vocational education is specific occupational training. The purpose of this program is to train pupils to earn a livelihood in a recognized occupational field. Training may be given on four occupational levels: (1) *semiskilled* — a machine tender or operator; (2) *skilled* (craftsman) — a machinist, carpenter, dressmaker; (3) *semiprofessional* — an accountant, salesman, nurse; (4) *professional* — an engineer, physician, teacher.

The occupational or vocational training given in our public secondary schools fits boys and girls as wage earners in semiskilled and skilled trades. The majority of this vocational training is given in agricultural, trade and industrial occupations, and in home-economics activities. It is subsidized by the Federal Government under a grant known as the Smith-Hughes Federal Vocational Act, which came into existence February 23, 1917. Industrial arts does not receive a federal or state subsidy. In recent years there have been attempts by public school administrators and professional organizations to secure federal aid for general education. Thus far their efforts have failed. Senate Bill S1313, which proposed a federal appropriation of $300,000,000 for general edu-

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The Industrial-Arts Program
(Trains to live)

1. All boys are accepted. Girls should not be excluded.
2. Employs a flexible program
   a) The course of study is a tentative guide.
   b) Trains for general development.
   c) Informal procedures — individual and group instruction.
   d) Recognizes pupil interests and needs.
3. Recognizes individual differences, needs, and interests; and considers manipulative skill as relative.
   a) Provides for individual and group projects.
   b) Offers opportunities to apply academic subject matter in practical learning situations.
   c) Provides for the innate constructive tendencies of individuals on an amateur basis.
4. Emphasis is on the social and economic significance of material cultures and values applied to everyday life.
   a) Examples:
      "Man Is a Tool Using Animal"
      "The Evolution of Tools"
      "The History of Iron"
      "The Age of Light"
      "The Story of Aviation"
5. A sympathetic understanding of boys and boys' interests.
   a) Scout activities, clubs, hobbies, interest in mechanical devices such as airplanes, boats and power projects.
6. Provision for exploration, designing and creating pupils' ideas and interests.
   a) Pupil progress is measured by individual growth through application of manipulative processes and integration of academic subject-matter content. (Cultural attitude.)
7. Adaptation of the program to human needs and endeavors.
   a) Recognizes current social, economic, and occupational trends, and guidance values.
8. An understanding of the objectives of the school's program.
   a) A program of work which assists the school to realize its general as well as specific educational objectives.
9. The quality of the program is determined by the cultural development of the pupil, his avocational interests, appreciation of material cultures, and the acquisition of amateur manipulative skills.
10. Proficiency in general education is recognized as basic training in the liberal arts, i.e., the fundamentals of oral and written English, mathematics, natural sciences, social sciences, languages, the fine arts, the industrial arts, health activities, etc., with the purpose of freeing the pupil from ignorance, prejudice, and superstition; of giving an insight and an understanding of the evolution and culture of the world and its people as a basis for formulating valid judgments and conclusions in a rapidly changing civilization, in order to live happily and efficiently and to develop healthy and well-adjusted members of society.

The Vocational Program
(Trains to earn a living)

1. Boys and girls are selected on the basis of aptitude, intelligence, and interest.
2. Employs a standardized program.
   a) The course of study is based on the development of definite skills and closely related technical information in mathematics, science, and drawing.
   b) Trains for a specific occupation or job.
   c) Formal and sequential procedures — individual and group instruction.
   d) Recognizes the employer's interests and needs.
3. All students must attain a definite commercial and industrial standard of skill and productivity.
   a) Provides specialized training.
   b) Provides work experiences in modern production processes.
   c) Provides for the constructive tendencies of individuals on a job and commercial basis.
4. Emphasis is on specific technical information, skills, and techniques.
   a) Mechanical and engineering handbooks, rules, tables, formulae, graphs, charts, etc.
5. A sympathetic interest in the needs and problems of youths preparing for employment and of adults already employed, who may need adjustment.
   a) Training on jobs and projects which are usable and function in the productive work of the world.
6. Provision for a check on industrial proficiency as it relates to time, quantity and quality of products.

a) Progress is measured by quality and quantity of production. (Commercial attitude.)

7. Adaptation of the training program to the current needs of industry and commerce.
   a) Recognizes the necessity for fitting the individual to the job. Employs the techniques of vocational guidance.
8. An understanding of the needs of industry as it applies to trained workers.
   a) A program of training which permits the trainee to enter industry with a minimum of maladjustment.
9. The quality of the program is determined by the ability of the student to secure employment in the field for which he has been trained; to hold a job; and to progress in his occupation with a minimum of maladjustment.
10. Proficiency in occupational life is recognized, generally, among vocationalists by the formula E = M + T + I + J + P, or *efficiency* equals *manipulative ability*[1] plus *technical information* plus *manipulative intelligence* plus *manipulative judgment* plus *personality*.[2]

cation, failed to be brought to a vote in the 77th Congress. Vigorous action for its passage is expected in the new congress.

Conclusion

According to a U. S. Office of Education report, the public vocational schools have trained 3,500,000 men and women for the war effort since the program began in July, 1940. The total number trained in public vocational schools in World War I was 60,000. This gives some indication of the tremendous burden and responsibility these schools have been carrying. The value of occupational training has caught the imagination of a large part of the American public as in no previous period. The postwar era will, in all probability, be even more strenuous for these schools, as millions of warworkers must be retrained for peacetime pursuits. The educational experiences which accrue from the war-training program should be of inestimable value in organizing an occupational training program for the restoration of agriculture, business, and industry on a peacetime basis and economy.

While the vocational program is flourishing, the industrial-arts program is faced with serious problems of contraction due to decreased enrollment, lack of teachers, materials, and supplies. Mathematics, science, and physical education are the curriculum areas which are stressed by the military authorities. In the industrial-arts program, if the various areas are taught properly, these academic subjects are put to a practical and functional use. Subject matter, regardless of area or type, if pursued as an end in itself is rather useless; if, however, it is pursued as a means to an end it becomes useful and meaningful. Many industrial-arts teachers, especially the younger men, have been inducted into the military service or have entered war plants where salaries greatly exceed those of the teaching profession. Supplies and materials are difficult or impossible to secure due to priority ratings. Some method or program should be devised for the utilization of the tools, machinery, equipment, and available teacher man power in the industrial-arts field. This group of professionally trained shop teachers stands ready and willing to serve in this hour of need.

Furthermore, everyone is agreed that World War II is a technical war, a war of machines; therefore the generalized basic training pupils receive in the industrial-arts area of the general curriculum can serve a twofold purpose — military and industrial. If the war continues over a period of years, the present secondary school population will constitute the ultimate working force and military reservoir of man power. The military authorities have stated that 63 per cent of their personnel must be technically trained. War technology embraces hundreds of different occupational skills. The same tools and basic skills are found in many different occupations, hence the training students receive in their industrial-arts classes, with a wide variety of tools and materials, should provide a basic foundation for giving specific technical training, either for military service or for industrial plant pursuits. It would decrease the training period and assist in weeding out the unfit.

With the development in industry of new tools, new processes, new techniques, and new materials, through the "all-out war effort," and the realization, on the part of educators, that work experiences are an essential part of the whole school program, general as well as vocational, there is every indication that the vocational and industrial arts programs will be scrutinized closely and re-examined at the termination of the war, and that significant changes will take place in these curriculum areas as well as in the entire system of American education. This is the inexorable law of progress.

[1]An ability is innate capacity or aptitude plus training Example: The ability to drive an automobile.

[2]Personality may be defined as the sum total of an individual's habits and attitudes. In this respect the schools can and should accomplish significant changes in the social growth of the students.

Significant References for Use in Promoting Graphic-Arts Education

Compiled by R. RANDOLPH KARCH*

One's own opinion in promoting the graphic-arts courses during wartime is of little relative value. The compilation of the references here give one needed authority, backed by leading writers in the foremost printing and lithographic journals as well as in other more popular magazines, to which anyone should listen with respect.

The references appear here in several categories:

1. The importance of the graphic arts in winning the war.
2. The necessity of training women in the graphic arts.
3. The war's effect on the graphic arts.
4. Opportunities for youth in the graphic arts.
5. Health and accident hazards in the graphic arts.
6. Hints on the promotion of graphic-arts education.

The references herein will enable the graphic-arts teacher to promote his field of education with the unlimited backing of experts. He can publicize his department of industrial arts or vocational education in several different ways:

1. By word of mouth, to superiors, local organizations, and printers and lithographers.
2. Through the use of direct mail advertising directed to printers' and teachers' organizations.

Looking to the following references for data in the promotion of the graphic arts and graphic-arts education, the teacher can use his own discretion with regard to acceptable material to meet the needs of the moment. The application of this material can be an invaluable aid to prevent a possible complete submersion of his craft in the present hectic wartime days.

It is the job of each graphic-arts teacher to do all that he can to point out the values

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in his type of education. He cannot depend upon the printers to do that for him. Upon him rests his own salvation.

Importance of the Graphic Arts in Winning the War

Some 20 million maps have been sold since the outbreak of the war. The U. S. Coast and Geodetic Survey turned out more than 1,600,000 maps for fighters in 1941. Making a modern map calls for the expenditure of from 10 to 20 thousand dollars, and many months of work by 50 to 100 people of infinite skill. — *This Week,* September 9, 1942, p. 11.

Victory pamphlets and propaganda for neutral and allied countries are printed in colored inks in 14 languages and in 40 dialects. — *Cincinnati Enquirer* gravure section, September 13, 1942.

Those in charge of army men are recognizing more and more the value of publications for the men themselves, and are encouraging the development of publications of this type. There are now over 1000 of such printed projects. — *Modern Lithography,* October, 1942, p. 19.

The U. S. Army Air Corps is building a $1,745,000 lithographic plant in St. Louis as a military necessity.— *Printing,* October, 1942, p. 65.

The Engineer Battalion of the army has issued a call for the following personnel from litho firms: photolithographers, lithographic engravers, photo cameramen, darkroom men, photo retouchers, and litho pressmen. Inductees may apply for these positions. — *Lithographers Journal,* October, 1942, p. 326.

The army and navy are literally run on paper — paper that is printed or lithographed. For example, it takes 100 tons of paper to build one battleship. — *Inland Printer,* March, 1942, p. 72.

Nautical and aeronautical maps are produced in great numbers — 2½ million were produced in 1941. — *Converter,* March, 1942, p. 28.

Warships maintain their own printing shops, and three linotypes now lie at the bottom of Pearl Harbor in the sunken Arizona, Oklahoma, and Oglala. — *Linotype News,* January-February, 1942, p. 3.

Printing is vital in keeping our armed forces going, and 100 tons of printing were required for the first registration. There are 18 forms for each new soldier, and 900 other Army forms. The first printing of the Army Manual of Information would make a stack of books 16 times as high as the Washington monument. — *Printing,* October, 1942, p. 52.

The army rates printers as technicians, and employs many in its plants estimated at from 100 to 300. — *Inland Printer,* May, 1942, p. 31.

Chanute Field alone produces 6 million lithographed sheets of paper a year. — *Journal of the National Assn. for Printing Education,* March, 1942, p. 5.

Photos, maps, orders, circulars are a part of the work accomplished by printing soldiers in the ground forces and engineers. — *American Printer,* June, 1942, p. 19.

For 1943, the Treasury Department has appropriated $5,300,000 to defray the cost of printed matter used in the sale of War Savings Stamps and Bonds. — *American Printer,* October, 1942, p. 50.

Jap agents were planted in seized countries years ago for fifth column work. They included photographers, printers, and map makers. — *Liberty,* November 7, 1942, p. 57.

The Stars and Stripes, published for the AEF in England, is now a daily for the first time in this or the last war. It is the fastest growing newspaper. — *Time,* November 9, 1942, p. 63.

On July 19, Japs searched every house in Manila and seized printing equipment — this is one of the first acts of any invader to destroy possibilities of disseminating its philosophy. — *Book Manufacturers Monthly,* Aug.-Sept., 1942, p. 2.

Advertising in wartime sells available products, keeps trade names before the public, assists in maintaining labor relations and thereby increases war production, and assists the public to get the greatest possible use out of products they have. — *Modern Lithography,* October, 1942, p. 27.

War Ration Book Two ran 150 million copies and will be a Christmas present to all Americans. — *Electrotypers and Stereotypers Bulletin,* October, 1942, p. 7.

In Axis countries the newspapers are as much an arm of the government as is the submarine or the airplane. Papers in Germany, Italy, and Japan are not media of information, but for making people think what the government wants them to think. Facts and truth are never permitted to stand in the way of advancing the homeland's interests or depreciating the enemy. Contrast that to the Newspapers of America. — *Editor and Publisher,* September 26, 1942, p. 7.

Clandestine newspapers of the French Underground slow down war production for Hitler by their appeals to the French worker. Printed propaganda is more important to the Underground this year than sabotage or acts of terrorism. All groups have centered around their newspapers. The total press run, by printing, lithograph, and mimeograph, totals about 200,000 a week. — *Life,* August 24, 1942, p. 42.

British libraries estimate that the English are doing twice as much reading now as in peacetime. — *Saturday Evening Post,* October 10, 1942, p. 57.

A dozen battles may be influenced by one book. — *Bookbinding and Book Production,* August, 1942, p. 17.

The sugar rationing job took 700 million pieces of printed matter consuming 300 carloads of paper and 30,000 lb. of ink. — *Advertising Age,* February 23, 1942, p. 16.

Seven million Red Cross First Aid Handbooks were manufactured from Pearl Harbor to April, 1942, and were then being produced at the rate of a million a week. — *Bookbinding and Book Production,* April, 1942, p. 38.

Printing is a *war* industry. — *Graphic Arts Monthly,* May, 1942, p. 31.

National Selective Service Headquarters lists the following printing jobs as essential, as a guide for local draft boards. These jobs are essential to the war effort:

Bankman	Monotype keyboard man
Composer operator	Offset pressman
Compositor	Overlay cutter
Cylinder pressman	Photoengraver
Electrotyper	Photocomposing machine operator
Lithographic engraver	Photolithographer
Composing room foreman	Platen press operator
Pressroom foreman	Cylinder pressman
Linotype operator	Press platemaker
Machinist	Printer all around
Make-up man	Stereotyper
Production manager	Web pressman

— *Cincinnati Post,* October 20, 1942.

Printing plants have a very low potential for complete conversion because printing machines are not suitable for anything except printing. — *Inland Printer,* May, 1942, p. 41.

The British government is interested in converting printing plants into munition factories. They are interested primarily in envelope making and punching machines, platen machines, nipping machines, blocking machines, cutting machines, plating baths and rolling mills. — *Members Circular of the British Federation of Master Printers,* August-September, 1942, p. 86.

Litho supply houses have converted in part to war production, some to total conversion. Regular lithographers can do copying to an accuracy of .001 of an inch. Materials that can be made are belting, multicolor maps and charts, scales, templates. — *Lithographers Journal,* October, 1942, p. 312.

The total advertising bill for 1941 has been estimated at $1,900,000,000. Direct mail and printed material absorbed 315 million. Radio got only 225 million, and the rest went for various publications. — *Printers Ink,* March 27, 1942, p. 19.

The total circulation of 1857 daily newspapers for 1941 was 42 million. — *Editor and Publisher Yearbook,* January 31, 1942, p. 112.

The British magazine *Vogue* had as much advertising in 1941 as it had in 1940, and refused half again as much advertising in order to balance editorial matter and ads. — *Typo Graphic,* June, 1942, p. 4.

Printing is not becoming a nonessential industry. Certain kinds of printing will stop, but the industry of printing is very much a part of war production and war waging. — *Graphic Arts Monthly,* November, 1942, p. 8.

Any printer or lithographer who is still courting the idea that he can still do business "as usual" is flirting with failure. No one today is doing business as usual. The sooner the printer realizes this fact and does something about it, the better for himself and his customers. Government approved graphic-arts products include the following:

Price control	Maintenance for durable goods
Rationing	War bonds and stamps
Antihoarding	United Nations
Anti-inflation	USO, army and navy relief
Cessation of extra services	Postwar aims
Car pooling	Agriculture
Maintenance of consumer goods	War planting
Truck conservation	Minorities in the U. S.
Employee morale	Recruiting
Production drives	Hush-hush
Man power	Pan American and Civilian Defense
Food for health	
Safety	
Salvage	

— *Advertising Age,* October, 1942, p. 13.

The Necessity for Training Women in the Graphic Arts

A printing plant could operate very well with all girl operatives. — *Printing,* March, 1942, p. 35.

Women excel men in repetitive operation in printing. — *Inland Printer,* April, 1942, p. 44.

Because of the shortage of men, publishers are now subsidizing the printing education of young women. — *Editor and Publisher,* April 25, 1942, p. 26.

When men are called to war, 10 per cent are replaced by women. — *Editor and Publisher,* March 7, 1942, p. 3.

Women workers in publishing and printing make up the following percentage of workers:

	Per Cent
Total industry	23.7
Letter shop employees	73.6
Gravure	2.2
Commercial printing	20.7
Bookbinders	46.1

— Bureau of Labor Statistics, January, 1942.

Women work in the following capacities in printing plants: apprentices in composing rooms, pressrooms, binderies, as hand and machine compositors, proofreaders, pressfeeders, press operators, bindery hands, and machine workers. — Bureau of Labor Statistics, January, 1942.

The Printers National Association urged that women be employed for training in printing, and to take on, for part-time work, youths of school age. The loss of apprentices and press assistants is becoming acute . . . and there is no sign yet of girls. — *Printing,* October, 1942, p. 47.

The modern-minded Crain Printers, Limited, Ottawa, Canada, are well under way to solving the problem of labor replacement through intensified training of women and girls. At the end of three weeks, sufficient proficiency is shown to warrant students handling various kinds of work which is supervised by a qualified instructor. It has been proven that, given intensified instruction, female labor can be utilized to maintain instruction. — *Canadian Printer and Publisher,* October, 1942, p. 19.

Women are becoming a more important factor in the advertising field in sales and creative work. Skepticism has not yet been completely erased, however. As the war goes on, it appears inevitable that more women will be engaged in selling, producing, and purchasing.— *Advertising Age,* November 9, 1942, p. 2.

Of the 547,000 workers in paper, printing, and publishing, 277,000 will eventually be on war work. — Harry Hopkins, *American Magazine,* December, 1942, pp. 19 and 109.

The kin to printing, advertising, is feeling the drain of man power. Supply is down 10 to 15 per cent. A long war may impair seriously the reservoir of advertising youth, and may cause future difficulties. — *Advertising Age,* November 9, 1942, p. 1.

"There are now 14,300,000 women gainfully employed in the United States. By the close of 1943 this will be well over 18,000,000. This may mean that more than 40 per cent of the working population will be women, and this during the first two years of the war." — *Miss Lucy Ogden Norton,* Assistant Supervisor of Personnel at the Erie Works of the General Electric Company.

A situation in which country newspapers might have to depend entirely upon women to "put the paper together" was visualized by Harry L. Gage. Printing teachers had foreseen this difficulty, but newspapers had not done their part. Country editors need to awaken to their responsibilities, and teachers of printing should seek to arrive at a plan. Women will have to be trained to fill the gap. — *Editor and Publisher,* November 14, 1942, p. 51.

Calls to armed forces and booming war industries are taking men out of the printing industry faster than its volume of printing is decreasing. Solution is "draftproof" men over 44, and employment of women. Today we must, perforce, try to bring women back into the composing room. From present indications there is reason for optimism in the hiring of women. — *American Printer,* November, 1942, p. 46.

Many lithography shops have found it impossible to get manpower enough to turn out the volume they are maintaining. These plants, in almost every instance, are placing women in their shops, as camera operators, opaquers, strippers, retouchers, platemakers, flyboys, and in a few cases pressfeeders. — *Modern Lithography,* November, 1942, p. 19.

War's Effect on the Graphic Arts

This war will be a hard war; a war demanding every ounce of energy and sacrifice and devotion we can muster. It will hardly be won before the end of 1943 or 1944. It may continue till 1945 or 1946. — *John W. Studebaker,* High School Victory Corps, Federal Security Agency, Office of Education, August, 1942, p. IX.

Drastic controls may be expected over the printing industry to save material, time, and effort; to eliminate frills, to conserve man power. Only essential printing, and probably in the simplest forms, may soon be the watchword. All industry that cannot readily be converted to direct war effort must stand whatever curtailment of material, man power, and of end products that are necessary to provide the essential elements of war production so vital to victory. — *E. W. Palmer,* WPBman, *Advertising Age,* September, 21, 1942, p. 1.

Concentration of the industry is being considered. Printers will either prove their essentiality to the war effort, or run the risk of being shifted to some business that is essential. The fact that printing ranks about second in number of employees makes it one which may be called to release workers. — *Printing,* October, 1942, p. 29.

Some 14,000 of the 43,000 printing establishments will be forced out of business by the exigencies of the war economy within a year. Volume, however, will not decrease in proportion. — *E. W. Palmer, Advertising Age,* July, 1942, p. 24.

Six Eastern paper mills were shut down last July, three for the duration. Cause — lack of orders. — *Printers Ink,* July 10, 1942, p. 5.

England's printing production falls short of demands, and this is expected also of the postwar period. Periodicals get 20 per cent and bookmakers get about 40 per cent of prewar supplies. The demands for books have increased enormously. Job printers cannot begin to keep up with the demands. This is in part due to air raids. Almost a third of the bookbinding machines in London has been destroyed. — *South African Printer and Stationer,* August, 1942, p. 223.

The printers who will survive are those who possess courage, ingenuity, and fight. — *Thomas R. Jones, Inland Printer,* October, 1942, p. 41.

It would be the height of folly, in face of the man power shortage to boost printing sales . . . printing and publishing is an essential *civilian* industry. — *E. W. Palmer, Bookbinding and Book Production,* October, 1942, p. 27.

Newsprint production was frozen in the United States and Canada at 11 per cent under 1941. — *Editor and Publisher,* November 7, 1942, p. 3.

Required man power estimates for 1942 are 3,400,000 for the armed forces; and 10,600,000 for war work. This will take 8,600,000 from "nonwar industry." — *E. W. Palmer, Bookbinding and Book Production,* October, 1942, p. 25.

About 21,000 workers have been given to the armed forces by the daily newspapers. Newspapers have been hardest hit in the mechanical departments, where they are least able to make replacements. — *Editor and Publisher,* September, 1942, p. 10NW.

Up to June, 1942, 7348 men have been called to the colors from the printing and publishing industry. Compositors numbered 1474, lithographers 501 and printers 2432. — *E. W. Palmer* of the WPB.

Opportunities for Youth in the Graphic Arts

Now, printers are looking more and more to the vocational printing schools for fresh talent. — *National Printing Education Journal,* May, 1942, p. 3.

It is the opinion of the graphic arts press that the labor shortage will be with printers for some time unless they fill the schools with students. — *Inland Printer,* October, 1941, p. 57.

The accounting of all time by all working journeymen militates against the explaining of processes and methods to young learners. — *National Printing Education Journal,* March, 1942, p. 15.

A thorough study into the fields of the graphic arts will reveal as many as 65 separate occupations. The time was never more propitious for youth to enter the graphic arts. (See reference below for a list of occupations giving nature of the work, working conditions, personal qualities needed, preparation needed, opportunities for advancement, compensation, and advantages and disadvantages.) — INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, November, 1942, page 384.

The shortage of man power is becoming exceedingly acute in the mechanical departments of the nation's newspapers and threatens to become a major problem . . . the main source of trouble is in hiring apprentices. — *Editor and Publisher,* November 14, 1942, p. 45.

I predict that for at least two years after the war, there will be a tremendous boom in the graphic arts. — *Harvey Glover, Modern Lithography,* September, 1942, p. 38.

There has been a steady decline in the number of shop-trained apprentices since 1910. In 1910 there was one apprentice for every 12 journeymen; in 1920 there was one to 14 journeymen, and in 1930 there was only one apprentice for every 20 journeymen. — *Facts About the Printing Industry for Schools, American Type Founders Co.,* p. 3.

In one state of the union, of 3700 indentured apprentices in the various trades, only two are in printing. The employer wakes up when no skilled labor is available. — *Journal of the National Assn. for Printing Education*, October, 1942, p. 7.

Jobs will be plentiful and wages high after the war — after one has completed his in-school training. — *Journal of the National Assn. for Printing Education*, May, 1942, p. 3.

Printers are in dire straits now for youth to train in their own methods and procedures of production. — *New England Printer*, March, 1942, p. 9.

If training is started now, graduates would be ready for the revival of peacetime business. — *Inland Printer*, February, 1942, p. 28.

There is a scarcity of trained workers, and this scarcity will increase. — *Journal of the National Assn. for Printing Education*, May, 1942, p. 3.

"The horse is stolen" — our young people have left the (printing) industry for greener fields. Shall we now "lock the barn, or shall we unite in a supreme effort to train a new crop of apprentices?" — *Journal of the National Association for Printing Education*, October, 1942, p. 2.

Significant fact: most of the weapons being used today were made six months ago, the plants which made them went into operation back in 1941, the machine tools were ordered late in 1940. Which means that machine tools made this year will produce weapons which will not go into action until late in 1943 or 1944. If the war should end about this time, that ten-year output of tools, put to work on postwar civilian goods, may leave the machine toolers with little to do till 1954 — *Time*, September 14, 1942, p. 79.

In one Michigan city, of 52 junior high school students going into the vocational high school, 44 signed for the machine shop, the rest for printing and drafting. None signed for woodworking. — *Personal letter to R. Randolph Karch.*

To keep workers in the printing industry, give them some hope of advancement to better jobs. Use high school students part time. All peacetime business will not collapse — but some employees believe this — convince them. — *Inland Printer*, October, 1942, p. 35.

Estimated Number of Graphic-Arts Establishments, 1939*

Branch	Establishments		Employees	
	Number	Percentage	Number	Percentage
Commercial printing	15,000	39.6	137,000	25.1
Newspapers	12,000	31.6	195,000	35.8
Letter shops	1,500	3.9	10,250	1.9
Periodicals	3,075	8.1	60,000	11.0
Books	1,500	3.9	41,000	7.5
Music	200	0.5	1,000	0.2
Lithography	1,000	2.6	33,600	6.2
Gravure printing	25	0.1	3,100	0.6
Photoengraving	700	1.8	12,800	2.3
Electrotyping and Stereotyping	250	0.7	6,000	1.1
Steel and copperplate engraving	450	1.2	6,500	1.2
Bookbinding	1,500	3.9	31,000	5.7
Typesetting and advertising typography	800	2.1	7,750	1.4
Total	38,000		545,000	

*Estimates based primarily on the U. S. Bureau of the Census, Census of Manufacturers, 1939, and Census of Service Establishments, 1939, and figures of the National Recovery Administration, U. S. Department of Labor, Economic Factors Bearing on Minimum Wages in the Printing and Publishing and Allied Graphic Arts Industry, September, 1942, p. 19.

The trend in wages is up in the graphic arts, and they fluctuate less than in all but one comparable industry. — *Facts About Printing for Schools, American Type Founders Co.*, p. 14.

In 30 of the 67 occupations for which figures were shown in a survey of publishing and printing workers, male workers averaged in excess of $1 per hour; in 10 they averaged between 80 cents and $1, and in only 10 did they average less than 60 cents. — *Earnings and Hours of Work in Book and Job Printing and Related Industries*, Bureau of Labor Statistics, Jan., 1942, p. 21.

Workers averaged 40.1 hours during a sample week studied in January, 1942. — *Ibid.*, p. 37.

A brief review of the trend in wages in the printing industry reveals that a survey reflects the printing industry's wages at their highest recorded level. — *Ibid.*, p. 7.

Working conditions in publishing and printing are relatively favorable. Most branches show but minor seasonal fluctuations in employment. Few manufacturing workers have greater job security than the printers. — *Ibid.*, p. 5.

At the request of printers and binders, the Montreal School of Graphic Arts was inaugurated in Quebec by the Canadian government. Linotype, monotype, composition, bookbinding, Ludlow and letterpress machinery will be taught. — *Printing Review of Canada*, September, 1942, p. 5.

Business is already mobilizing to prevent a postwar slump, and is getting postwar jobs ready. — *Nations Business*, Sept., 1942, p. 31.

Health and Accident Hazards in the Graphic Arts

Many people still seem to believe that the printing and lithographic profession is hazardous to workers. The following facts may help to change this erroneous opinion.

Compared with other industries, printing and lithography show a good accident record, and have one of the lowest severity rates. — INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, November, 1935, p. 335.

Machines do not cause the accidents in printing, but the handling of objects does. — *American Printer*, August, 1941, p. 28.

Printers as a group are fairly healthy. One's long and continuous employment in the graphic arts is not incompatible with reasonably good health. — INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, December, 1935, p. 361.

Lead poisoning is now confined to those who dross metal pots. — *Inland Printer*, March, 1942, p. 30.

Cleaner working conditions today have increased the life span of printers from 44 to 65 years. — *Editor and Publisher*, September 13, 1941, p. 35.

Printing ranked third, among the lowest of 31 industries in accidents. Credit for the low injury rate belongs to the small plant. — *Printing*, October, 1942, p. 45.

Hints on the Promotion of Graphic-Arts Education

Education is war work. Strong arguments supporting this statement were presented by top-ranking federal officials at the "National Institute on Education and the War" recently held in Washington. President Roosevelt, Paul V. McNutt, General Somervell, Leon Henderson, Elmer Davis, James M. Landis, and many others stressed the vital importance of the schools in the winning of the war. — *National Education Association Publicity*, October 15, 1942.

The old type of promotion for graphic-arts vocational high schools is out of date:

1. Generalities are out of date.
2. Too much harping on such terms as the "art preservative of all arts" is manifest.
3. Too much stress is given on the success of those who *once* were printers, but now, since they are in other professions, are either famous or rich.
4. Repetition of the word *trade* is overdone. This carries the connotation of dirty hands, low pay, long hours, and a dirty collar.
5. Reiterated tales of tramp printers — now gone for years — and poor working conditions, give false impressions.
6. Harping on Gutenberg and other long-dead printers is overdone.
7. Too much misinformation is given in vocational guidance:
   - *a*) That one must be good in English, grammar, art, spelling and the like.
   - *b*) That there are health hazards such as lead poisoning, tuberculosis, etc.
   - *c*) That presses often mangle fingers and hands.
   - *d*) That one cannot become a printer if one is color blind.
8. Poorly administered vocational guidance is a factor, where all trades are lumped together for the boys and girls who can't pass the academic subjects.
9. There is too much talk about what printing *has* been — not enough about what it is *now*.

If graphic-arts education suffers any decline of considerable proportions, it will be caused by these factors:

1. Inertia on the part of printing teachers.
2. A disinterested attitude of the local printers where the school is located.
3. Neophobia — the fear of new things or ideas — on the part of both the printer and the teacher.
4. An ingrained thought pattern on hours that printing teachers should work.
5. Lack of an ability on the part of the teacher and the advisory council of the school to adequately publicize the work.
6. Lack of sufficient support from higher officials in the school system.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
John J. Metz, Editor

The Crippled Child

Probably at no time in our history have we been so conscious of what it means for an individual to drag himself through this earthly life, afflicted with a crippled body. The war, thrust upon us by perfidious enemies, bids fair to send home many young men with broken bodies which will never again serve their masters as they did when our boys left our shores in the pink of mental and physical condition.

With this somber picture before us, we can more readily understand why every American ought to subscribe wholeheartedly to the appeal made by the National Society for Crippled Children which is conducting its tenth annual sale of Easter seals for crippled children from March 26 to April 25.

These crippled youngsters deserve our deepest compassion because, with little or no fault of their own, they are condemned to lead an existence almost apart from that led by normal children of their own age. Without financial help from the general public, many of these little sufferers have no opportunity to get medical service which may change their distorted bodies in such a way that they may enjoy normal or near normal life.

There are many appeals made at present. The appeal for help to the crippled child ranks high among these. Let us give it our most earnest consideration.

Boys' and Girls' Week

The National Boys' and Girls' Week Committee is to be commended that they are making strong efforts to make a success of the National Boys' and Girls' Week, April 24 to May 1, in these hectic days of international strife. With the nation looking forward hopefully, yet anxiously, at the outcome of World War II, and the dreadful losses in human life which final victory will entail, it is doubly necessary that the children who are now in school should not be forgotten.

The necessity of giving children more intensive care at this time is plainly evidenced by the rising delinquency rate. The old saying, "Just as the twig is bent the tree is inclined," contains as much truth today as when it was first enunciated. If the children now at school are to learn the ways of democracy, they must get a good grounding in the concepts of democracy from their very youth.

Shop teachers can do much to make the 1943 observance of Boys' and Girls' Week successful. If they want assistance in planning the program for their community they can secure it by writing to the National Boys' and Girls' Week Committee, 35 East Wacker Drive, Chicago, Ill.

Reducing Paper Consumption

As our readers no doubt know, governmental regulations require all periodicals to cut down their paper consumption by at least 10 per cent. In order to do this without causing the subscriber the least amount of loss, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION will hereafter set all main articles in nine-point type on ten-point bodies. This will insure readability in spite of reduced type size. At the same time, however, and much to our sorrow, we will have to discontinue for the duration the publication of full-page illustrations backed by blank pages to facilitate transparentizing for purposes of making blueprints. Drawings similar to those used heretofore for this purpose will be published, however, so that those teachers who want to make use of them in their courses, can trace them for classroom use.

Besides this, as many readers may already have noticed the height of the magazine has been reduced from twelve and one quarter to twelve inches. This seemingly small reduction has produced a saving of 2 per cent of the paper formerly used.

Other economies will be worked out, but the readers will always be kept in mind, and every effort will be made so as not to curtail the quantity of reading matter.

Canceled Conventions

Because of war limitations on travel and hotel accommodations, increasingly more conventions of local, state, and national organizations will necessarily be canceled. This, no doubt, will be a cause for regret to many teachers who have faithfully attended the meetings of their professional associations year after year.

However, the loss caused by this interruption to the annual meetings for discussion and planning is not irreparable. The more careful reading of the professional literature offered by the various magazines and books in the educational field will largely offset any loss that may thus result. Practically every issue of a good professional magazine carries far more material than could be packed into a one or two-day convention. Besides this, the magazine preserves the thoughts presented within its pages for future reference. Furthermore, the same leaders who appear on the convention programs are usually the ones who write the professional magazine articles. While then the cessation of conventions for the duration is deplorable, the professional magazine presents a way out which will largely obviate the loss due to the suspension of the annual meetings for exchanging ideas and planning for the future.

The Navy's College Training Program

This training program is designed to produce Navy, Marine Corps, and Coast Guard officers.

Those eligible for the training are: high school and preparatory school students who will attain or have attained the age of 17 years by July 1, 1943, and who have or will graduate from their respective schools by that date. Applicants must be under twenty on July 1, 1943.

Qualifying tests will be held throughout the nation on or about April 2, 1943. The first group of those selected will be assigned to college and go on active duty in uniform under military discipline by July 1, 1943. They will be rated as apprentice seamen, United States Naval Reserve.

A second group will be started about November 1, and another group in March, 1944.

Student Vocational Training Record

R. J. KING*

The vocational-training-record card illustrated herewith, was designed for use in vocational-training courses for war-production workers and for persons in training for war-production occupations. By keeping in mind that any usable record system must be simple and easy to use, all nonessential information was eliminated. Through the process of experimentation and revision, sufficient data has been incorporated to provide a complete record of the progress achieved by a trainee. In addition to serving as a record for student achievement, the record card is also a supervisory and teaching aid.

Many defense classes are taught by men drawn from industry. Very few of these men have had teaching experience, and, therefore, are very often found weak in class and shop organization. The use of the student record cards, with class procedures and course of study worked out in simplified form, has greatly increased the efficiency of all teachers and especially the teachers with only an *industrial experience* background.

It is suggested that the record cards be made of three-ply material. A supply can be obtained from any local supply house or local printing company. For economy, the stock should be purchased in large squares and cut into 8½ by 11-in. sheets. Holes should be punched so sheets will fit in an inexpensive two-ring loose-leaf binder. For best results it is suggested that the corners of the sheets be rounded to prevent the edges from curling.

There are several methods by which the cards can be printed. If funds are available a local printer will do a good job at little cost. A school print shop is always a good possibility. However, there is another method that is available to all schools, and that is the use of mimeograph and duplicating machines.

When a variety of color of stock is available, it might be advisable to print the record cards on different color stock. The cards for welding classes might be printed on white paper, machine-shop record cards on red paper, etc.

Each shop instructor should be given an adequate supply of record cards. A separate card is filled out for each new trainee that enrolls in a training class. All the record cards of any one class are inserted in a loose-leaf binder, making a neat, compact and very usable class record book.

It is important that the cards are filled in correctly. The name of the trainee should be spelled accurately. The date of enrollment should be exact and not a guess. The name of the course is to be written in the space provided. The code or classification number of the course helps to distinguish it from other courses in the same program and aids in facilitating financial and statistical data. The particular type of training which an enrollee is receiving is listed in the space for *Occupational Training*. For example, a trainee enrolled in a machine tool operation course might be receiving training as an engine lathe operator.

Statistical data requires that the name of the agency referring a person for training be marked accurately. In all pre-employment and supplementary courses, each trainee is required to fill out a VE–ND Form 1. A space is provided for the name of the person who is responsible for seeing that the VE–ND Form 1 is properly filled out and filed.

Adequate space is provided for keeping a record of the clock hours a trainee spends in training. The time record, if properly maintained, will show the exact number of hours, days, weeks, and months spent in training. A clear record of absences and attendance is also shown.

The progress record shows the amount of work or training completed. It is suggested that the operation units be so arranged that they coincide with the local course of study. However, if so desired, the operation units can be omitted when original printing of forms is being done. By so doing, the individual instructors can write in their own operation units to fit their own needs and desires.

When a trainee has completed his training, the instructor will fill out a TER Form (Trainee Evaluation Report) in addition to any remarks he wishes to add on the vocational record card, and turn both, the record card and the TER Form over to the local supervisor. The supervisor can then sum up the data received and if the progress and achievement of the trainee has proven adequate, a Form 114 (certificate of completion of course) may be issued to the trainee completing the course. The training record card is then filed as a permanent record.

A duplicate record of all trainees completing a course should be made and for-

STUDENT VOCATIONAL TRAINING RECORD
Saline County Vocational School, Harrisburg, Ill.

Name of Trainee Ben Gray Date enrolled 2 - 2 - 42 (Mo. Day Year) Date left program 4 - 10 - 42 (Mo. Day Year)

Course Machine Tool Operation Code 7-4257C Occupational Training Lathe Operator

Trainee referred to training by N.Y.A.___ W.P.A.___ U.S.E.S.___ X VE-ND Form filed by Jackson

RECORD OF HOURS SPENT IN TRAINING

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Monthly total
Feb.		6	6	6	6	6			6	6	6	6	6			6	6	6	6	6			6	6	6	6	6					120
March		6	6	6	6	6			6	6	6	6	6			6	6	6	6	6			6	6	6	6	6			6	6	132
April	6	6	6		6	6	6	6	6																							48
																															Grand total	300

PROGRESS RECORD

X 1. Safety test	X 19. Centering work in chucks	X 32. Knurling
X 2. Parts of the lathe	X 20. Removing chucks from spindle	___ 33. Faceplate work
X 3. Types of lathe tools	___ 21. Taper turning	X 34. Filing and polishing
X 4. Grinding lathe tools	X 22. Types of tapers	___ 35. Lapping
X 5. Centering lathe tools	X 23. Drilling, reaming, and tapping	X 36. Spring winding
X 6. Locating center of stock	___ 24. Cutting screw threads	___ 37. Coil winding
X 7. Drilling center holes	X 25. Standard screw-thread terms	X 38. Use of center rest
X 8. Operation of carriage	___ 26. Standard change gear equipment	X 39. Willing in the lathe
X 9. Operation of tailstock	___ 27. Quick change gear equipment	X 40. Use of steel rule
X 10. Spindle speeds	___ 28. Taper boring	X 41. Use of outside calipers
X 11. Shifting lathe belts	X 29. Screw-thread tables	X 42. Use of inside calipers
X 12. Mounting work between centers	X 30. Use of thread dial	X 43. Use of Micrometers
X 13. Use of lathe dogs	X 31. Knurling	X 44. Use of Hermaphrodite calipers
X 14. Facing	___	___ 45. Use of depth gauge
X 15. Turning	___	X 46. Lubricating oils
X 16. Machining shoulders	___	X 47. Cutting oils
X 17. Use of lathe centers	___	X 48. Test indicator
X 18. Lathe chucks - types	___	X 49. Speed indicator

Remarks Very good on precision work

Form TER filed by Jones on 4 - 10 - 42 (Mo. day year)

Form 114 issued by John Doe on 4 - 10 - 42 (Mo. day year)

Trainee Ben Gray Instructor R. Jones Supervisor John Doe

Training record

*Supervisor, Vocational Training, Saline County Vocational School, Harrisburg, Ill.

warded to the local U.S.E.S. office. The local employment office officials can use the duplicate record in making referrals for job opportunities.

If convenient when printing record cards, an additional number can be printed on thin paper stock, and a record can be made for the trainee to carry on his person to use as credentials when applying for a job.

It will be found that sufficient information may be obtained from the *vocational training record* to enable the local supervisor to fill out practically all local and state forms, records, and reports.

The following are progress records taken from student vocational training records for the various courses in occupational training.

Progress record for forge and heat-treating:

.... 1. Safety test
.... 2. Building and maintaining a forge fire
.... 3. Heating work
.... 4. Measuring and cutting stock
.... 5. Riveting
.... 6. Drawing out stock
.... 7. Drilling
.... 8. Twisting
.... 9. Use of hack saw
.... 10. Forging tool steel
.... 11. Annealing tool steel
.... 12. Heat-treating tool steel
.... 13. Holding work
.... 14. Upsetting
.... 15. Punching holes
.... 16. Cutting threads
.... 17. Use of Hardie
.... 18. Soldering
.... 19. Tapping
.... 20. Use of hot cutters
.... 21. Use of fullers
.... 22. Use of swage
.... 23. Tool dressing
.... 24. Heading
.... 25. Forming a punch type
.... 26. Swaging
.... 27. Fullering
.... 28. Striking
.... 29. Bending round and rectangular stock
.... 30. Bending eye
.... 31. Filing
.... 32. Welding
.... 33. Case hardening
.... 34. Brazing
.... 35. Painting metal
.... 36. Working high speed steel

Progress record for acetylene welding:

.... 1. Safety test
.... 2. Setting up apparatus
.... 3. Bead welding
.... 4. Edge welding
.... 5. Heavy bead welding
.... 6. Building up basses
.... 7. Butt welding
.... 8. Lap welding
.... 9. T welding
.... 10. Fillet welding
.... 11. Cutting plate
.... 12. Vertical welding
.... 13. Pipe welding and cutting
.... 14. Ripple welding
.... 15. Braze welding
.... 16. Brazing
.... 17. Copper welding
.... 18. Aluminum welding
.... 19. Lap brazing
.... 20. Cast iron welding
.... 21. Cast iron brazing

Progress record for arc welding:

.... 1. Safety information
.... 2. Safety test
.... 3. Setting up apparatus
.... 4. Striking the arc
.... 5. Bead weld flat position
.... 6. Continuous uniform bead weld
.... 7. Oscillating the electrode
.... 8. Beading and building up
.... 9. Study of size and use of electrodes
.... 10. Expansion and contraction
.... 11. Butt joint flat position
.... 12. Butt joint flap position backing strip
.... 13. Bead weld vertical position
.... 14. Bead weld overhead position
.... 15. Butt joint vertical position
.... 16. Butt joint overhead position
.... 17. Fillet weld T joints flat position
.... 18. Fillet weld lap weld flat position
.... 19. Fillet weld T joint overhead position
.... 20. Fillet weld lap weld overhead position
.... 21. Fillet weld T joints vertical position
.... 22. Fillet weld lap joint vertical position
.... 23. Shielded arc electrode
.... 24. Butt joint deep V flat position
.... 25. Butt joint deep U flat position
.... 26. Bead welding thin gauge metal
.... 27. Corner joints thin gauge metal
.... 28. Edge welding thin gauge metal
.... 29. Pipe welding

Progress record for shaper operations:

.... 1. Safety test
.... 2. Setting up apparatus
.... 3. Adjusting and clamping work in vise
.... 4. Adjusting stroke
.... 5. Regulating speeds
.... 6. Mounting stock in vise
.... 7. Sharpening bit
.... 8. Adjusting bit in holder
.... 9. Rough cutting
.... 10. Precision cutting
.... 11. Use of rule
.... 12. Use of square
.... 13. Use of protractor head
.... 14. Use of verniers
.... 15. Use of micrometer
.... 16. Use of calipers
.... 17. Adjusting table
.... 18. Use of parallels
.... 19. Vertical cutting
.... 20. Horizontal cutting
.... 21. Lubricants

Progress record for milling-machine operations:

.... 1. Safety test
.... 2. Oiling
.... 3. Mounting work
.... on table
.... in chuck
.... on arbors
.... between centers
.... on special jigs
.... 4. Clamping work
.... 5. Selecting proper cutter
.... 6. Sharpening cutter
.... 7. Positioning table
.... 8. Mounting cutter
.... 9. Regulating spindle speed
.... 10. Regulating feed
.... 11. Direction of feed
.... 12. Use of proper coolants
.... 13. Starting a cut
.... hand feed
.... automatic feed
.... 14. Gear cutting
.... 15. Use of arbors, collets, and chucks
.... 16. Use of different cutters
.... 17. Use of dividing head
.... 18. Indexing
.... 19. Milling of flat cuts
.... 20. Milling taper cuts
.... 21. Milling helical cuts
.... 22. Milling spirals
.... 23. Milling bevel cuts

Progress record for drill press operations:

.... 1. Safety test
.... 2. Setting up machine
.... 3. Use of chucks
.... 4. Use of drills (twist)
.... 5. Use of drills (center)
.... 6. Hand feeding
.... 7. Automatic feeding
.... 8. Use of vises and clamps
.... 9. Cutting oils
.... 10. Lubricating oils
.... 11. Sharpening drills
.... 12. Drilling speeds
.... 13. Use of jigs
.... 14. Drilling to dimensions
.... 15. Drilling to witness marks

Progress record for bench machinist:

.... 1. Safety test
.... 2. Study of steels
.... 3. Measuring lengths
.... 4. Use of hack saw
.... 5. Use of power saw
.... 6. Use of copper sulphate solution
.... 7. Use of scribe
.... 8. Use of prick punch
.... 9. Use of center punch
.... 10. Use of dividers
.... 11. Use of rule (1/64 in.)
.... 12. Use of steel square
.... 13. Use of protractor head
.... 14. Use of vise
.... 15. Use of hammer
.... 16. Use of chisel
.... 17. Use of files
.... 18. Making witness marks

Progress record for sheet-metal worker and layout:

.... 1. Safety information
.... 2. Safety test
.... 3. Making a dimensioned sketch
.... 4. Developing patterns
.... 5. Making a bill of materials
.... 6. Cutting stock (both hand and machine operations)
.... 7. Folding edges
.... 8. Forming cylinders with rolls
.... 9. Forming with a brake
.... 10. Hand grooving
.... 11. Machine grooving
.... 12. Bending for reinforcing or making connections
.... 13. Swaging for reinforcing or making connections
.... 14. Crimping to shrink edges
.... 15. Burring edges with machine
.... 16. Peening, setting down, closing down seams
.... 17. Forming on stakes
.... 18. Double forming on stakes
.... 19. Double forming on machines

.... 20. Turning edges with machine
.... 21. Wiring edges by hand
.... 22. Wiring edges by machine
.... 23. Riveting sheet-metal joints
.... 24. Tinning a soldering copper
.... 25. Soldering tin plate
.... 26. Soldering copper
.... 27. Soldering zinc
.... 28. Soldering galvanized iron
.... 29. Brazing copper and brass
.... 30. Raising or bumping sheet metal
.... 31. Flanging or stretching sheet metal
.... 32. Punching holes with hollow or solid punch
.... 33. Drilling holes
.... 34. Tinning brass, copper, iron
.... 35. Cutting wire glass
.... 36. Cutting with circle shears
.... 37. Spot welding
.... 38. Compressed air riveting hammer

Evaluation of Teaching Efficiency

THERON D. GARD*

Many high schools employ only one industrial-arts teacher, who is the instructor and supervisor combined. In such a situation, how may a teacher measure or evaluate the efficiency of his teaching?

A supervisor has said: "To get a picture of what we are doing, we must have some method of evaluating the efficiency of our teaching. We must build objective tests and use the data correctly. We must interpret the results, not primarily to test the youngsters, but to check our own teaching. . . . Too much stress must not be placed on the testing of factual material. It is unfortunate that the desirable attitudes, habits, and ideals we wish to develop in our pupils cannot be tested objectively, but they must be considered in every lesson taught and in every course we build."[1]

Supervisors have found a testing program to be of value in this measurement of teaching efficiency, so the individual teacher should develop a testing program adapted to his own situation. Newkirk and Green[2] have listed the measurable factors in industrial subjects. They recommend that each factor should be tested separately. Accordingly, there are many objective tests, some standardized, which may be used for industrial-arts courses. Perhaps those most predominantly used are information tests of various kinds.

Another writer on industrial-arts testing states: "The best purpose that any test or educational procedure can accomplish is to increase the educational and social stature of youth. Most tests and many educational procedures do just the opposite. . . . The point of the whole matter is that our tests have been concerned too much with mere knowledge, with mere encyclopedic nonessentials. . . . Our tests and measurements have not tested the values really significant for life success, hence the pupil knows that report cards themselves are often a farce."[3]

In the abundance of objective tests available, and which may be constructed by the teacher, we should be able to find effective means of testing for the acquisition of information, skill, personality traits, and other of the measurable factors. We should also go farther. We should attempt to discover or invent new devices to aid in the proper evaluation of our teaching efficiency. Tests should be constructed in terms of the objectives, rather than in terms of subject-matter content and skills.

Naturally, the teacher will use the results of his testing program as a basis for improvement of his teaching procedure. As Mann has stated: "Measurement for measurement's sake has no place in the ordinary school system. Testing, and then merely filing away the results, without following them up, is the greatest sin perpetrated by those interested in the measurement. Correct interpretation of the results and remedial administration, supervision, or teaching that will follow which will aid the child to learn more effectively, are the real values in testing."[4]

The following outline of procedure should prove helpful in the self-evaluation of teaching efficiency.

1. Have clear-cut, definite, attainable objectives.

2. Set up teaching units which embody these objectives.

3. Make sure that pupils are conscious of the objectives.

4. Organize a testing program which uses a variety of objective tests, of high validity.

5. Use supplementary checking devices, such as pupil-rating cards and progress cards based on performance.

6. Observe, in so far as possible, how, and to what extent, the courses taught are effective in school and out of school.

7. Check on the testing and rating program, by *self-examination* at various intervals.

Teacher's Self-Examination

1. Do I have definite, clearly defined objectives for this course?

2. Can the average pupil attain these objectives?

3. Are the objectives of the course fully understood by the pupils?

4. Are my teaching units analyzed in terms of my objectives?

5. Do I have a planned and organized testing program?

6. In planning my testing program, have I kept my objectives in mind?

7. Do the tests used have a high degree of validity?

8. Do my pupils come up to the "norm" of the standardized tests used?

9. Do I use both *information* and *performance* tests, in the proper proportions in my objectives and teaching?

10. Do I use a variety of objective tests and other devices?

11. Do I permit pupil criticism and suggestions concerning the tests used?

12. Do I spend time testing for nonessentials?

13. Do I test for attitudes, traits, habits, and ideals, without some teaching definitely designed to develop them?

14. Do I use test results merely as a basis for pupils' grades?

15. Do I attempt to improve my tests and testing program from year to year?

16. Do I revise my teaching units and methods in order to obtain better attainment of objectives?

17. Do my objectives, standards of performance, and pupil attainments compare favorably with state standards, etc.?

18. Does my testing program show pupils to have attained or neared the objectives in information, performance, and character traits at the end of the term?

19. Are the objectives attained by pupils reflected in their subsequent activities, appreciations, interests, or attitudes to any perceptible degree in other courses, subjects, or at home?

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*High School, Fairbury, Neb.

[1] Pickens, Verne L., "The Improvement of Teachers by Supervision," *Industrial Education Magazine*, Jan., 1939, pp. 32–36.

[2] Newkirk and Greene, *Tests and Measurements in Industrial Education*, 1935 (New York City: John Wiley and Sons, Inc.).

[3] Hunter, W. L., "Socializing Tests and Measurements," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Dec., 1938, p. 405.

[4] Mann, Geo. J., "Educational Tests and Measurements," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, June, 1937, pp. 175–177.

A class of elementary teachers and an exhibit of the work done

Training Elementary Industrial-Arts Teachers

GEORGE M. FREEMAN*

The industrial-arts department of East Texas State Teachers College introduced and sponsored a course in elementary industrial arts for some years. The purpose of this course is to train the elementary teacher in those simple crafts which will help her to interpret and vitalize the many fields of instructional content. The work is designed primarily for grades three, four, five, and six.

The following aims and objectives set forth for elementary industrial arts are kept paramount in this teacher-training course.

1. To stimulate in the minds of the pupil purposeful planning, resulting in greater levels of achievement.

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2. To interpret environment through a knowledge of materials, tools, industrial processes, and vocations.

3. To train the pupil how to wisely care for his health, money, and materials; also to conserve his energy and his time.

4. To provide experiences in order that pupils will develop desirable personal social traits.

5. To develop dexterity through the manipulation of materials and tools.

6. To promote originality and a proper sense of design in form, color, construction, selection, and use of material things.

7. To develop enduring avocational interests through effective utilization of leisure time.

Two complete units of work are offered, a beginner's unit and an advanced unit. In both units originality, workmanship, and skills are carefully stressed. The beginner teachers' unit provides them with hand tools such as could be used by grade children. The projects are executed in softwoods and taught in the following order of difficulty:

1. Simple animal figures painted in various colors with tempera.

2. Advanced animals with glued parts, painted in various colors.

3. Animals in groups or combinations painted in various colors.

4. Wooden plaques with burned designs and overlays consisting of a variety of subjects such as book ends, wooden notebook covers, and an endless group of interesting patterns.

In the advanced unit the teachers exe-

A group of elementary teachers finishing their projects, and a diorama unit completed by a group of advanced students

cute designs and patterns in: (1) metal pins, (2) metal etching and piercing, (3) intricate patterns in wood, and (4) figures in papier mâché which are then used in a unit diorama setting constructed by the group.

For those teachers who have completed the required units in this elementary program and who wish to train for work on the junior high level the department offers a separate and specific course in advanced crafts. This includes: (1) art metal, (2) leather, (3) book binding, (4) plastics, (5) ceramics, (6) linoleum block cutting, (7) wood carving, (8) tincan craft and electroplating.

The aim or objective of industrial arts on the junior high school level is emphasized with the teachers who elect this course. The aim is to acquaint the junior high school pupils with the various fields of industrial activity as well as to help each interpret and understand his environment.

Testing and Tests

Performance Tests and Objective Observation*

EINAR E. SIRO**

Evaluation of the results of instruction is an indispensable phase of any technical training program. Too often it is neglected entirely or consists solely of pencil and paper tests given during or at the completion of the course. While written tests are important, they fail to measure all the outcomes of instruction. Performance tests and objective observation must be used to supplement written tests, especially in programs where the emphasis is on the development of specific skills and proper work habits.

By administering either oral or written tests it is difficult to attempt to measure with any degree of accuracy such factors as the student's willingness to work, the quality and quantity of his work, or the observance of safety rules. A student may be able to quote from memory all the safety rules, but this is no assurance that he will adhere to them. Many students have language difficulties or are deficient in academic background and do not comprehend written material or express themselves clearly. As a result they are at a disadvantage when given a written examination. Some students are able to write what should be done, explain it orally, answer all questions, and yet lack the ability to perform the manipulative work. *The only way to be sure an individual can do something is to have him do it — manipulative skill must be demonstrated.*

Performance tests can be set up to measure rather accurately the student's ability to do certain operations or parts of the work. A combination of written and performance tests serve to check representative phases of achievement; but, to have a complete evaluation, the shop instructor must also observe critically while the student works.

There are situations where observation of the student while he works serves as the only necessary means of evaluation. This is especially true in short training programs where the main purpose is the development of skill in performing certain manipulative operations or in operating certain equipment. All formal tests take student time which, in this type of program, could better be spent in the development of the necessary skills. Observation check lists occupy little or no student time. They can be used by the instructor to record his evaluation of the student's techniques as well as the quality and quantity of the operations or jobs completed. The main objective is to be sure that the student can do satisfactorily what he is supposed to do when the training is completed. Mastery of fundamental skills is essential to the formation of a proper apperceptive basis for further development and success.

Performance tests, objective observation, oral tests, and written tests all have their places in the evaluation of manipulative work. This article is primarily devoted to the development and administration of the performance test and objective observation techniques.

The purposes of evaluation in a technical training program through written, oral, and performance tests and objective observation are:

1. To determine achievement before the student starts training in order to avoid repetition of work already mastered.
2. To reveal student misconceptions and difficulties in order to determine where further assistance is needed.
3. To reinforce learning through review and purposeful activity.
4. To determine when the student or class is ready for the presentation of new material to insure continuity of learning and instruction.
5. To develop in the instructor a critical attitude toward his own work and its improvement. This can be made even more effective through the use of a self-evaluation check list for the instructor.
6. To provide an opportunity for application of material in a new situation — transfer of knowledge, problem solving ability, *trouble-shooting* ability.
7. To provide an incentive to the students, or motivation through friendly competition, for further application and learning. To establish definite goals to be reached in order to encourage speed and accuracy in the student's work.
8. To predict future success with present achievement and skills as a basis.
9. To serve as a basis for supervision of the physical setup of the training program including the care of tools, equipment, materials, buildings, and grounds.
10. To determine student achievement for the purpose of assigning marks in order to:
   a) Provide objective evidence to prospective school, employer, or commander, or for student advancement.
   b) Provide a basis for guidance within and beyond the training area — placement, research, comparison.
   c) Establish standards or norms.

*This is the sixth of a series of articles by staff members of the Teacher Training Department, Armored Force School, Fort Knox, Ky. Brig. Gen. S. G. Henry is the commandant of the school, and Lt. Col. Verne C. Fryklund is director of teacher training.

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Performance Tests

A performance test is designed to measure how well the student can do a given manipulative task. He is required to make, service, repair, depict, operate, shape, form, assemble or disassemble something under controlled conditions. While he is at work, his speed, accuracy, technique, or a combination of these qualities are checked as accurately and objectively as possible. This is the shop performance test. All tests, to a degree, require some doing on the part of the student. This may consist of writing, checking, underlining or encircling the answer, or the giving of an oral answer; but they cannot be classified as performance tests.

Merely asking a student to perform an operation and casually watching him is not a satisfactory performance test. A performance test requires much planning and preparation. It is as exacting as a pencil and paper test. The frequently accepted criteria[1] for a good objective written test, composed of recall and recognition items, can be applied to performance tests. Before constructing the test, it must be decided exactly what is to be measured and how the results are to be recorded and used. *A performance test, like any other test, cannot be justified unless the results in some way are used constructively.*

Elements That Can Be Measured By Performance Tests

Performance tests may be used to measure such elements as one's speed, accuracy, tool technique, work habits, procedure, trouble-shooting ability, observance of safety rules, and the identification and correct use of parts, materials, and tools in doing a given task. Seldom are tests constructed to measure only one of these elements at a time since many of them are interdependent. For example, tests of speed include a degree of accuracy, and tests of accuracy have a time limit. Tests are constructed which emphasize one or more of these elements as in the following cases:

1. *Accuracy.* Tests with emphasis on accuracy are designed to determine the quality of the student's work. The quality of a weld, the correct adjustment of a control unit, the quality or exactness of a foundry pattern, and the technique used in the operation of a radio receiver are examples of this type of test.

2. *Speed.* Tests with emphasis on speed are used to measure the quantity of work a student can do in a given interval of time, rate of response, and speed in the use of tools, equipment, and instruments in comparison with other learners. Tests measuring the number of words a student can receive and send in code, the time needed to mount and dismount a machine gun in a tank, or the time needed to change the rear tire on a motorcycle come under this heading.

3. *Identification and correct usage.* Tests with emphasis on identification and correct usage are given to evaluate the student's ability to recognize and assemble parts, and to select and employ the correct tool in a specific situation. These tests are applied to such learning situations as when and how to use a precision tool, select the material and make a particular type of gasket, and identify and assemble the mixed parts of the accessories from a wheeled vehicle as the generator, starter, or carburetor. Simply calling upon the student to recognize or associate the correct name of a tool, piece of equipment, material, or instrument would not be considered as performance testing. In a performance testing situation the student is required to do certain manipulative work.

4. *Trouble shooting.* Tests with emphasis on trouble shooting are designed to measure the student's problem solving ability in locating and correcting operation difficulties. Determining adjustment trouble in a telegraph key and remedying it, or locating electrical trouble in an engine and putting the machine back into operation are examples of this type of test.

Performance tests reveal weaknesses that are difficult to detect in any other way. For example, a student of wheeled vehicle maintenance may be able to remove a tire from the rim but a performance test may reveal any number of the following situations that hinder learning or efficiency:

a) He starts demounting the casing before the tube is sufficiently deflated.
b) He uses tools in such a way that there is danger of damaging the tube, casing bead, spring lock ring, rim, or valve stem.
c) He uses the wrong tool to perform a given step.
d) He handles the tools in such a way as to endanger himself and his fellow students.
e) He goes through many extra and meaningless motions.
f) He becomes emotionally upset as he recognizes his own inefficiency.

The following are samples of operations that can be checked by a performance test. How to:

1. Adjust trunnion bearings.
2. Forge weld.
3. Ride a motorcycle.
4. Remove a minor dent from a fender.
5. Assemble and disassemble Thompson Sub-machine Gun.
6. Start and drive M–4 Medium Tank.
7. Adjust telegraph key.
8. Cut threads on the lathe.
9. Paint with a spray gun.
10. Adjust receiver to zero beat with incoming signal.
11. Clean and adjust spark plugs.
12. Connect plug to insulated and shielded radio power cable.

General Directions for Developing a Performance Test

1. Examine the course of study, which should be based upon the analysis of the trade or job in question, in order to select the learning situations in which student achievement may be measured best by means of performance tests.

2. Determine whether the necessary tools, equipment, materials, and space for administering the test are, or will be, available. The test must be given under *similar controlled conditions* each time it is administered. As with any other type of test, even the time of the day or the day of the week when the test is given has a tendency to affect the results. For example, students taking the test at the beginning of the school day tend to be more alert than those taking it at the end of the school day. All necessary materials, tools, and equipment should be supplied.

3. Check to be sure the test is measuring what it is supposed to measure. If the requirement is to measure the student's technique in the use of tools or measuring instruments, does it emphasize that measurement or something else such as speed or accuracy?

4. Consider the time that will be involved in administering the test. If it is an individual performance test, what are the rest of the students going to do while they are waiting to take the test?

5. Consider the practicability of the test in terms of the cost of materials used.

6. Construct the test with adequate consideration of comprehensiveness. Does it thoroughly cover sufficient material to justify its use?

7. See that the test coincides with a practical situation the student is expected to meet later.

8. Make provisions for scoring the results objectively without requiring a lot of *paper work*. Think of the method of scoring when planning the test. Consider self-evaluation devices, such as charts, check lists, rating scales, and samples of work for the students. Use check lists, rating scales, and physical measuring instruments whenever possible. Provide a key for scoring.

9. Prepare specific directions for the student including a statement as to the exact purpose of the test. Use language understandable to the student. Be sure the student understands all directions; what he is to do, where he is to do it, and how he is to do it.

[1]The commonly accepted criteria of a good test are: (1) *Validity* — A test is valid if it measures what it is supposed to measure. This is the most important quality of any test. (2) *Reliability* — Reliability refers to the accuracy with which a test measures what it does measure. (3) *Objectivity* — A test is objective if each item permits one and only one interpretation by the student and by anyone scoring the test. This assures uniform scoring and fairness to the student. (4) *Discrimination* — A test that distinguishes between different levels of ability is said to discriminate. (5) *Comprehensiveness* — A test is comprehensive when it adequately covers the material in the course or part of the course that is being evaluated. (6) *Ease of administration and scoring.* A good test must be easy to score, have clear directions, have an adequate place for the answers, and have a key for scoring.

10. Prepare directions for the examiner to follow while administering the test. He should be well acquainted with the test before attempting to administer it.

11. Revise the test from time to time if necessary. Take it yourself first, have fellow instructors take it, give it to a few selected students, and then make the necessary revisions. Do not be discouraged if weaknesses are brought to light after the test is administered to a number of students; any good test takes time to perfect and no one can discover the shortcomings as well as a group of students.

12. Calculate the mean, standard deviation, reliability coefficient, and norms for the test. To have sufficient data to do this, keep a complete record of the scores made on the test.

Administration of Performance Tests

Group and Individual Tests. The number of students to whom a performance test can be administered at one time depends largely upon the nature and main purpose of the test and the amount of necessary equipment. Certain situations will require that the teacher's attention be focused exclusively upon the activity of a single student. For example, the testing of a student's technique in the disassembly and assembly of an automotive generator would require that the instructor watch and record carefully every move the student makes in order to discover weak and strong points. If the same test were designed to measure how fast a student could disassemble and assemble the generator, it would be necessary to check only the time required to do the task and then the completed job. In this case it would not be necessary for the instructor to watch a student carefully; thus several students could be tested at one time. The number of generators available, within reasonable limits, would determine the number of students that could be tested at one time. The same conditions would hold true if the students were checked while they made something; that is, the major emphasis of the test would determine the number of students that could be tested at one time.

The instructor should do everything in his power to get the student to feel at ease before and during the time he is taking the test. The student tends to be under an emotional strain while taking any type of formal test and this affects the results. The instructor must also be at ease as his emotional condition affects the student's condition.

Recording the Results. The accurate recording and rating of performance is very important. Regardless of the purpose of the test, great injustice would be done to the students and the entire training program if either the test or method of recording the results were deficient and failed to segregate the students. As nearly as possible, we want to be sure to *select the right man for the right job.*

An objective check list of specific points involved in the task and definite predetermined standards of workmanship and performance should be used in scoring. The time, materials, tools, equipment, and all working conditions should be the same each time the test is given. Refer to the sample performance test, observation check lists, and the material on developing and using observation check lists given later in this article. The weighting of items should be avoided; equal weight for all items facilitates recording and rating. The speed and accuracy with which the task is performed can be scored by the good judgment of a competent and unbiased checker aided by accurate measuring instruments. These instruments would include micrometers, squares, specially constructed gauges, jigs, and scales, as well as rulers, templates, neon timing lights, meters, stop watches, and tension or torque wrenches.

Sample Performance Test

This performance test with emphasis on speed and accuracy was prepared for and is used by the Automotive Electricity Division of the Wheeled Vehicle Department of the Armored Force School, Fort Knox, Ky. It is composed of three parts: directions to the student, directions to the assistant instructor or checker, and a check list for recording the results.

Wire and Time An "In Line" Gasoline Engine

(Possible score 15 points)

Directions to the Student

This test is designed to measure how well you can *wire* and *time* an "in line" gasoline engine. The method has been covered thoroughly in class. All necessary tools and equipment will be furnished. You will be checked on:

1. *Speed* (5 points). If you are able to complete the task within 15 minutes, you will earn the maximum 5 points for this part of the test. One point will be deducted for every 5 minutes spent over 15 minutes in solving the problem. You will be asked to stop work if the test is not completed within 35 minutes. The following table shows the points earned in relation to the time spent.

Within 15 minutes — 5 points
15 to 20 minutes — 4 points
20 to 25 minutes — 3 points
25 to 30 minutes — 2 points
30 to 35 minutes — 1 point
Over 35 minutes — 0 points

2. *Accuracy, procedure, observance of safety rules, and the care and use of tools and equipment* (10 points).

Follow this procedure while taking the test:

1. Report to the "chief-of-shift," as directed by the instructor, and secure the check list for the test. He will designate on the check list the time, the assistant instructor who is going to check your work, and the number of the engine on which you are going to work.

2. Report directly to the assistant instructor and give him the check list. Remember, the *time started* is the time you leave the desk of the "chief-of-shift" and the *time completed* is the time you return to his desk.

3. Begin work as soon as possible. When you have *wired, timed,* and *run* the engine, get your check list from the assistant instructor and take it to the "chief-of-shift." He will record the *time completed* and determine your final mark on the test. The assistant instructor has observed and checked your work.

4. Return to your engine and help the assistant instructor prepare the engine for the next student taking the test.

Directions to the Assistant Instructor or Checker

1. Read thoroughly the directions given to the student for taking the test. Study the check list. Be sure you understand the test before attempting to give it to the student.

2. Put the student to work as soon as possible. His test *time started* begins when he leaves the desk of the "chief-of-shift."

3. Observe and check the student very carefully on the items in Part Two of the test.

4. Add the points earned in *Part Two* of the test and record it in the proper space at the bottom of the check list as soon as the student has finished.

5. Have the student go to the "chief-of-shift" and get the *time completed* recorded

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Check List for Recording the Results

Performance Test: Wire and Time an "in line" gasoline engine.

Student..... Section..... Date.....
Engine Number..... Assistant Instructor.....

Part One: (5 Points) *Time required to wire satisfactorily and time the engine*

Time started..... Time completed..... Time required.....

Schedule of Time and Points Earned

Within 15 minutes — 5 points
15 to 20 minutes — 4 points
20 to 25 minutes — 3 points
25 to 30 minutes — 2 points
30 to 35 minutes — 1 point
Over 35 minutes — 0 points

(Student to discontinue taking test if not completed within 35 minutes.)

Points earned by the student (encircle one) —
5 — 4 — 3 — 2 — 1 — 0

Part Two: (10 points) *Assistant Instructor: Check student on each point.*

Encircle the 1 after the item in the Yes column if the answer is Yes and the 0 in the No column if the answer is No.

Check While Student is Taking the Test

	Yes	No
1. Battery ground cable disconnected until wiring completed	1	0
2. Grounded battery terminal tested for spark before connecting to battery cable clamp	1	0
3. Engine starts the first time	1	0
4. Student careful not to race the engine	1	0

Check After Student Has Completed the Test

5. Ammeter wired correctly	1	0
6. Proper firing order at distributor and spark plugs	1	0
7. Generator and control unit wired together correctly	1	0
8. Ignition switch wired into circuit	1	0
9. All tools used correctly and safely	1	0
10. All tools and equipment cared for properly	1	0

Points earned in Part One .....
Points earned in Part Two .....
Final Grade (Possible 15) .....

and his final mark calculated. The student is to return and assist you to prepare the engine for the next student taking the test.

Objective Observation

Observation is directed attention. It is the type of evaluation used by all individuals as they judge their fellow men, other forms of life, and the physical world surrounding them. In a training situation it is the technique the instructor uses to evaluate the student, student progress, and the effectiveness of his instruction without administering an oral, written, or performance test. Observation provides a means of evaluating those more or less intangible outcomes of instruction, such as observance of rules and work habits, that cannot be checked by any type of test.

In using the observation technique in checking on student work, no specific instructions are given to the student. Observation is not as exacting as performance testing, but it saves student time and makes evaluation possible while the student works under natural shop conditions. It is the most useful means the instructor has for checking continuous progress. It rounds out the testing program by bridging the gaps left by oral, written, and performance tests. As previously mentioned, in some cases observation alone serves as sufficient evaluation. Check lists clarify the observation and insure a more accurate evaluation.

The effectiveness of this technique is dependent upon directed attention together with a preliminary knowledge of the situation. The ability to observe is possessed by all individuals to a certain degree, and can be further developed through practice. The more thorough the planning and preparation, the clearer the understanding of what is to be observed and the more accurate the final evaluation. There must be a systematic approach and the plan must be definite. If the observation is careless or the instructor does not know what to look for, certain points will be unduly emphasized while others will go unseen. When this happens, the mind is likely to fill the gaps with illusions or inaccuracies and a faulty evaluation and report is the result. This is especially true when the instructor bases his opinion of the student exclusively upon the observation of one or two things done correctly or incorrectly.

The quality of the observation and the record are further influenced by the interest, emotional status, philosophy, experience, and intelligence of the observer. The nature and the location of that which is to be observed — size, color, motion, complexity, and number — are also influencing factors. Check lists tend to reduce subjective influences.

What to Observe

It is not possible to list specific points that should be observed by all teachers in all situations. What is to be observed will be dependent upon such factors as the type of class, the type of equipment, the objectives of the course, and the background of the students. Attention should be directed to the details of performance as well as to the finished product. A teacher who is observing a student make the clutch linkage adjustment on a tank, for example, should watch carefully *as the adjustment takes place* rather than ignore the work until it is completed. There will be little chance of correcting errors if it is not known where or when the errors occurred. An error should be corrected as soon as possible in order to prevent establishment of poor habits.

The following list, while not exhaustive, suggests specific things that may be included in an observation check list. To develop a check list the instructor may select from this list the points that apply in his particular case and add any other points that he wishes to check. For simplicity, the points of achievement to be observed are placed under eight main headings with a number of specific points under each in question form.

1. *Work habits* — Is the student industrious? Does he loaf? Is he systematic? Neat? Thorough? Prompt? Does he follow instructions at all times? Does he display initiative? Does he strive for perfection or is he satisfied in just "getting by"? Does he maintain a proper working position for the job in question? Does he work when he believes he is not being observed? Is he able to avoid distractions while he works? Does he seek help only when necessary? Does he use materials economically? What undesirable habits does he have, if any?

2. *Planning ability* — Does he have the ability to plan his work? Does he follow correct order, procedure, or sequence? Is he resourceful? Does he have the ability to check his own work? Does he bring all necessary tools and materials at one time or does he have to make several trips to the toolroom? Does he make use of shop manuals, diagrams, charts, and texts in his planning? Does he use past learning effectively?

3. *Attitude, cooperativeness, and appearance* — Is he interested in the work? Enthusiastic? Does he take pride in his work? Does he try to show off? Does he work well with other students? Does he follow the rules and regulations as set forth? Does he keep himself as neat and clean as the job will allow?

4. *Quality or accuracy of work* — Does his work meet the established standards of workmanship for his level of learning? Is more drill needed? What is the quality of his work when he knows it isn't going to be checked?

5. *Quantity or speed of work* — What is his rate of response? Is the student able to do the amount of work expected? Has he progressed satisfactorily since last observed?

6. *Technique in the use and care of tools and equipment* — Can the student use the tools correctly and skillfully for his level of achievement? Does he keep the tools and equipment clean and oiled? Does he care for all tools properly? Does he report damaged tools?

7. *Aptitude* — Does the student demonstrate fitness for the work he is pursuing? Does the student have good muscular coordination? What are his shortcomings?

8. *Observance of safety rules* — Does he follow all the safety rules as set forth? Does he handle tools correctly? Does he wear goggles as directed? How does he dispose of oily rags? Does he use the guards on the equipment? Does he avoid taking unnecessary chances? Is he alert to new dangerous situations that arise in his work?

Developing and Using an Observation Check List

An important aspect of the technique of observation is the record that is made. In many cases only a mental record is kept of the observation, though a written record in the form of a check list will be more useful. The check list may be used as a permanent data sheet or a more condensed record may be compiled from it. The accuracy and completeness of the check list is dependent

upon a clear understanding and correct interpretation of what has been observed. No matter how good the observation, its worth will be decreased materially by a faulty report. Specific things or parts as well as the complete whole must be observed in order to get a full picture.

The check list should be developed in terms of the requirements of the particular situation in which it is to be used. It should be just long enough to accomplish the desired aim. The form should be such as to make for ease of checking, and the divisions used should be in terms of logically anticipated results. The abbreviated examples of check lists at the end of the article present a variety of methods for their development. It is easier to use a check list and the results will be more satisfactory if the ratings or divisions on each item do not exceed five and if the number of items to be evaluated is not large. If the items are not self-explanatory they should be explained at the bottom of the check list or on a separate sheet of paper to insure correct interpretation by all checkers.

The instructor must watch closely for direct evidence to assure valid and accurate results. Good judgment must be exercised, and good judgment assumes expert knowledge on the part of the observer as to what constitutes skillful performance. Shop teachers must strive to make their observations as objective as possible inasmuch as judgments tend to fluctuate from day to day. Personal prejudices must not be permitted to influence evaluation. There must be fairness at all times. A fairer evaluation results when an objective check list of the points to be observed is used.

As in the actual observing, training and practice will improve the instructor's efficiency in the use of a check list. With a little practice he will be able to retain data concerning several students at one time, which can be recorded at a convenient time during or at the end of the class period. However it must be remembered that the record should be made as soon as possible after the observation has taken place. The accuracy of the report decreases as the time interval between the observation and the report increases.

A continuous record of student progress assures a better understanding of the student and a fair rating at the end of the course. It also serves as an incentive to the student as well as to the instructor. These advantages are forfeited by the instructor who attempts to keep a mental record especially when classes are large and the course is short.

Abbreviated Sample Observation Check Lists

Student's Name .....Checker .....
Department .....Subject .....
Date .....Time ..... to.....

1. Five-Point Check List — Check A, B, C, D, or E; 4, 3, 2, 1, or 0 for each item. Count the checks in each column and multiply by the weight of the column. Add the points earned in each column to get the total points.

Items Checked[1]	*A (4)*	*B (3)*	*C (2)*	*D (1)*	*E (0)*
1. Observance of safety rules					
2. Ability to follow correct procedure					
3. Care of tools and equipment					
4. Tool technique					

It is also advisable to leave space at the bottom of the check list for any additional comments the instructor may want to make.

2. Three-Point Check List — Same as 5-point scale except the rating is limited to three categories.

Check — (2) student has reached full achievement, (1) student has reached half achievement or better, and (0) student has reached less than half achievement.

Instead of numerals the following ratings could be used:

(*VG*) Very good, (*A*) Acceptable, and (*NA*) Not Acceptable.

	2	*1*	*0*
1. Saw and square stock.....			
2. Sharpen drills			
3. Rivet with cold rolled rivets.....			

3. Two-Point Check List — Check student *Yes* or *No*, or *S* (Satisfactory) and *U* (Unsatisfactory).

The record can also be made by encircling 1 in the *Yes* or *S* column, or 0 in the *No* or *U* column. Statements are worded in such a way that *Yes* or *S* means student earns a point. Refer to check list for performance test on "How to wire and time an *in line* engine."

Work Habits	*Yes*	*No*
1. Follows instructions at all times.....	√	
2. Seeks help only when necessary.....		√
Planning Ability		
8. Checks his own plans.....	1	0
9. Applies material presented in class.....	1	0
10. Uses shop manuals and texts correctly.....	1	0

4. One-Column Check List — All ratings are placed in one column. Example, using (2) Very Good, (1) Acceptable, (0) Not Acceptable:

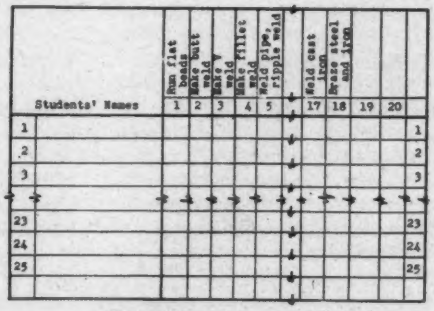
1. Clean and adjust distributor.....	2
2. Service steering gear and linkage.....	0
3. Adjust brakes	1
4. Service constant velocity joints and trunnion bearings.....	2

[1]Items that might be misinterpreted should be explained at the bottom of the check list or on a separate sheet of paper.

5. Memorandum Check List — Check in front of question or item: (X) needs help or unsatisfactory; (√) doesn't need help, or satisfactory; (0) no opportunity to observe. On the right of the question or item write a comment that can be used in future counseling.

Check		*Items*	*Remarks*
X	1	Ability to follow directions	Seems overanxious
√	2	Observance of safety precautions	
0	3	Ability to work with others	

6. Group Master Record, Progress Chart — The method of noting progress will depend on the instructor as well as on what the mark is to be based.



Group master record

The following observation check list is used by the communication department of the Armored Force School, Fort Knox, Ky., to aid in evaluating student progress during field operation. The student spends the first 11 weeks of his 14 weeks course in the classroom studying armored force communication and the last three in the field applying, under field conditions, what he learned in the classroom.

Grading Sheet *Field Operation*
Student's Name..... Class..... Date..... Time.....
Monitoring Instructor..... Station Call.....Score

Directions: Check each item *Yes* or *No*.

Yes	*No*	*Item*
		1. Zero beat receiver to NCS signal.
		2. Varies pitch of note by using CW OSC ADJ control and not detune receiver.
		3. Obtains maximum sensitivity of receiver by use of ALIGN INPUT control.
		4. Uses MVC on all signals except *Voice*.
		5. Determines if incoming stations are on correct frequency.
		6. Zero beats transmitter to zero beat established by the receiver (or frequency meter).
		7. Keeps plate current of transmitter within proper limits.
		8. Tunes antenna circuit to correct peak.

9. Turns off transmitter power as soon as transmission is completed.
10. Listens in before transmitting or tuning transmitter.
11. Stops transmitting and listens when another station breaks in.
12. Sends call signs only once initially or when readability is reported ZSB 4 or 5.
13. Sends call letters slowly and distinctly.
14. Leaves a definite space before and after the procedure sign V in call up.
15. Leaves a definite space between groups or words in the message.
16. Sends each group or word with same length space between characters.
17. Sends AS when an immediate answer is not made.
18. Sends an error sign and repeats last correct group when correcting a mistake in transmitting.
19. Answers net call in correct order.
20. Services correctly each received or transmitted message.
21. Enters tactical designation of writer and addressee on all received messages.
22. Files transmitted messages in right breast pocket and received messages in left breast pocket.
23. Turns over file of messages to relieving operator.
24. Fills out heading completely on each sheet.
25. Makes proper entry on log and signs when relieved.
26. Includes time of each entry on log.
27. Polices set thoroughly.
28. Observes all safety precautions.
29. Keeps connections tight.
30. Uses authenticators only when required.

SEMESTER EXAM — ADVANCED MACHINE-SHOP PRACTICE

EDWARD ASHLEY MILLER

Normal, Ill.

Directions: In the following true and false statements, encircle the T if the statement is true, and the F if the statement is false.

T F 1. The first thought of any machine-shop worker should be safety.

T F 2. All lathes are equipped with a feed rod and a lead screw.

T F 3. To be an expert machinist one must have a good basic knowledge of benchwork.

T F 4. Hammers, screw drivers, wrenches, hack saws, punches, chisels, etc., are considered benchwork tools.

T F 5. The proper formula for finding tailstock set over for turning a taper is: $S = \frac{L}{1} \times \frac{D-d}{2}$.

T F 6. The use of a lubricant when cutting threads on the lathe is an old custom adopted years back but which is now considered necessary.

T F 7. A lathe-cut thread is a better cut thread than is a die-cut thread.

T F 8. The apron control handle on the right-hand side of the apron is used to cut threads and never for longitudinal cutting.

T F 9. Chasing is the term used to indicate the motion of the apron when cutting threads.

T F 10. A ball-peen, straight-peen, and cross-peen hammer are all alike.

T F 11. The hammer or sledge of a blacksmith is the only handled anvil tool that has a wedged handle.

T F 12. A properly ground screw driver is pointed.

T F 13. A screw driver is made of tool steel.

T F 14. A properly ground screw driver and a properly placed screw are two of the little things that stamp a good mechanic.

T F 15. The same safety precaution should be observed when placing a large faceplate on a lathe as should be observed when mounting a chuck.

T F 16. When sawing with a hack saw the pull stroke is the cutting stroke.

T F 17. The proper tempering color is a purple emerging into straw.

T F 18. The top and bottom swages are used to finish round pieces of stock in forge work.

T F 19. A hack saw should be operated at a speed never to exceed 40 strokes per minute.

T F 20. Taps come in sets of three — taper, plug, and bottom.

T F 21. An acute angle is more than 90 deg.

T F 22. A micrometer spindle has 40 threads per inch.

T F 23. Air or kerosine is the best lubricant when tapping or threading cold-rolled steel.

T F 24. All lead screws are of a left-hand thread.

T F 25. A good machinist throws all of his tools on a board placed on the top of the lathe to the right of the tailstock.

T F 26. The United States produces more bauxite than any other nation.

T F 27. The sliding gear on the lathe is a quick way to change the speed of the lead screw or feed rod.

T F 28. A bench plate differs from a surface plate in the fact that the former is braced from below and the surface plate is smooth on both sides.

T F 29. A combination set consists of a rule, a squarehead, a center head, and a protractor.

T F 30. Oily rags should be either piled in one corner of the shop or put into a wooden box after they are used.

T F 31. The process of annealing is used to soften metal so that it can be readily worked or machined.

T F 32. A ½-in. drill should run at about 530 r.p.m. for proper cutting.

T F 33. A tap is a piece of hardened steel grooved on several points and sharpened to cut internal thread.

T F 34. The original lathe tools were forged tools consisting of tool and toolholder all in one on which only a front clearance, side clearance, and a side rake were necessarily ground.

T F 35. Drilling, boring, and reaming are three lathe operations and are always performed in the manner and order mentioned.

T F 36. A hack saw with 18 teeth per inch is the best for all-round work.

T F 37. The following are all layout tools: parallels, try square, angle plate, clamp, center punch, prick punch, scriber, hemaphrodite, surface gauge, bench plate, faceplate, ball-peen hammer, dividers, steel scale, and V block.

T F 38. The point of the file must always be covered with a handle before using the file.

T F 39. The shaper can be used to do almost any job that can be done in the milling machine.

T F 40. Pinning may be caused by using a new file under too much pressure.

T F 41. Tongs should be fitted to the stock as a safety first precaution.

T F 42. The face of the anvil is made of hardened tool steel.

T F 43. Pickup tongs are used more often for holding stock while forging it rather than picking up hot stock out of the forge.

T F 44. Lathe work is usually done to an accuracy of .002 of an inch, either + or —.

T F 45. The dead center on the lathe is not hardened.

T F 46. The lathe tool should be set at about 4 deg. above center.

T F 47. Chatter is caused by an improperly ground tool or a worn piece on the lathe saddle or carriage.

T F 48. The best lubrication for the tailstock center is white lead.

T F 49. The clearance angle of a twist drill is usually from 12 to 15 deg.

T F 50. For metalwork emery cloth is better than emery paper in so much as it can be used wet or oiled.

T F 51. A center punch is used to punch holes in sheet metal.

T F 52. A lathe bit to be properly sharpened need not be honed.

T F 53. A cold chisel is sharpened at a 20-deg. angle.

T F 54. Oily rags from the shop should be kept in a fireproof container.

T F 55. Most iron in the United States is found in the state of Minnesota.

T F 56. Most lathe tools are made from cast iron.

T F 57. A No. 8 drill will bore an 8/32-in. hole.

T F 58. The teeth of the hack saw point toward the handle.

T F 59. The largest copper mines in the world are in Montana.

T F 60. Band iron can be bent cold.

T F 61. Chasing refers to longitudinal cutting on the lathe.

T F 62. A hair can be measured with a micrometer.

T F 63. The bending jig is used to bend band iron.

T F 64. Peening can be done with a machinist's hammer.

T F 65. The work of the machinist is the same today as it was 20 years ago.

T F 66. It is possible to do wood turning on an engine lathe.
T F 67. There is no shortage in all-round machinist and toolmakers today.
T F 68. The engine lathe is the most useful machine in the metalworking industry.
T F 69. If a roof were to be made of tin in its purest form, it would not be durable.
T F 70. The old-fashioned type of blacksmith shop is becoming a rarity today because of young men failing to be interested in this art.
T F 71. By means of jigs, holes may be bored at many different angles on the drill press.
T F 72. A machinist can learn the trade in 9 months.
T F 73. A piece of copper is annealed for the purpose of making it harder.
T F 74. The strength of any material, piece, machine, or structure is its strength at its strongest part.
T F 75. Chipping, filing, and scraping require a high degree of skill.
T F 76. Loose neckties and long sleeves are often causes of accidents while working on a lathe.
T F 77. Both large and small holes are drilled at the same low speed.
T F 78. Injuries are rare to students using hand-operated machines.
T F 79. Always hold your work securely in your hand when using the drill press.
T F 80. Threading is the process of cutting threads on rods or inside of holes.
T F 81. A micrometer is a very expensive tool and a necessity to any machinist.
T F 82. The Bessemer process is used chiefly in the manufacture of low carbon steel.
T F 83. Emery cloth costs approximately 5 cents per sheet.
T F 84. Peening of any metal tends to soften it.
T F 85. Twenty-four gauge metal is heavier than twenty gauge metal.
T F 86. A machinist must be able to read a working drawing to be efficient.
T F 87. When measuring pieces less than the length of the rule you should place the rule on edge.
T F 88. The power hack saw cuts on the drawn stroke.
T F 89. A broken center drill must be annealed before it can be drilled out of the metal.
T F 90. A file is a piece of hardened steel with its face cut full of nicks.
T F 91. The spiral grooves cut in a twist drill are known as flutes.
T F 92. A machine should always be cleaned and oiled before using and again cleaned when finished.
T F 93. If the jaws of the lathe chuck move all together, the chuck is known as an independent chuck.
T F 94. An abrasive is an extremely hard and tough substance which has many sharp cutting edges.
T F 95. The combined drill and counter sink is always an angle of 82 deg.
T F 96. By turning the hand wheel of the tailstock to the right, the hard center will be loosened.
T F 97. The round nosed turning tool may be fed in either direction providing the top of the bit is ground flat.
T F 98. Before inserting centers in the taper spindles of a machine, the centers and spindles should be thoroughly cleaned.
T F 99. A true reading on a micrometer can be obtained only when one has developed a skillful feel of the micrometer barrel itself.
T F 100. The process of Knurling is best done where no lubricant is used.

Answer Sheet

1. T	21. F	41. T	61. F	81. T
2. F	22. T	42. T	62. T	82. F
3. T	23. F	43. F	63. T	83. F
4. T	24. F	44. T	64. T	84. F
5. T	25. F	45. F	65. F	85. F
6. T	26. T	46. T	66. T	86. T
7. T	27. T	47. T	67. F	87. T
8. T	28. F	48. T	68. T	88. T
9. T	29. T	49. T	69. F	89. T
10. F	30. F	50. T	70. T	90. T
11. T	31. T	51. F	71. T	91. T
12. F	32. T	52. F	72. F	92. T
13. T	33. T	53. F	73. F	93. F
14. T	34. F	54. T	74. F	94. T
15. T	35. T	55. T	75. T	95. F
16. F	36. T	56. F	76. T	96. F
17. T	37. F	57. F	77. F	97. T
18. T	38. F	58. F	78. T	98. T
19. F	39. F	59. T	79. F	99. T
20. T	40. T	60. T	80. F	100. F

1. Write a one-page summary of how to build a forge fire.
2. Write a paragraph on the use of the tap and die.
3. Explain how to grind tool bits for the lathe.
4. Name and explain 5 forging operations.

PREFLIGHT AVIATION TEST

HAROLD T. GLENN
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Unit V — Communications

1. An electron is a ..... particle of electricity.
2. Give two methods of producing electricity: (1)..... (2).....
3. The unit of measuring electrical pressure is called a .....
4. The unit of measuring electrical resistance is called an .....
5. The unit of measuring electrical quantity is called an .....
6. A high frequency carrier wave that has been altered by the human voice is called a ..... wave.
7. Electrons which are thrown off a white hot filament, in a vacuum tube, are collected on the plate when it is charged .....
8. The ..... circuit is for the purpose of receiving the radio frequency waves out of the air.
9. The ..... is the valve within a vacuum tube which controls the flow of electrons to the plate.
10. What are the Morse Code symbols for the letters?
    A ..... V..... H..... M..... N..... O.....
11. A device used to change sound waves into electrical impulses is called a .....
12. Planes with radio receivers only (no transmitters) must acknowledge radio signals by ..... or at night by.....
13. When riding the radio beam a plane must always keep to the right in the ..... zone.
14. The code of silence is an .....
15. The fan marker warns the pilot that he is ..... when riding the radio beam.
16. Indicate the proper teletype symbol for Clear sky ..... Overcast sky..... 4:30 pm.p.s.t..... West wind 18 m.p.h. ..... Heavy rain ..... Barometic pressure 1015.2 .....
17. Give three types of visual signals and methods of sending them:
    (1) .....
    (2) .....
    (3) .....

Key

1. Negative
2. (1) chemical; (2) induction
3. Volt
4. Ohm
5. Ampere
6. Modulated
7. Positive
8. Antenna
9. Grid
10. A . — V . . . — H . . . . M — — N — . O — — —
11. Microphone
12. Wiggling their wings; flashing their landing lights.
13. Twilight
14. Area directly over the sending station where no signal is heard.
15. Approaching the field.
16. ◯; 1630P; R+; ⊕; → 18; 152.
17. (1) Lights, flashing, Morse Code.
    (2) Lights, colored, green — O.K., red — stop.
    (3) Flags, semaphore signals.

Dream not too much of what you'll do tomorrow,
How well you'll work perhaps another year;
Tomorrow's chance you do not need to borrow —
Today is here.

Boast not too much of mountains you will master,
The while you linger in the vale below;
To dream is well, but plodding brings us faster
To where we go.

Talk not too much about some new endeavor
You mean to make a little later on.
Who idles now will idle on
Till life is gone.

Swear not some day to break some habit's fetter,
When this old year is dead and passed away;
If you have need of living, wiser, better,
Begin today.

— Author Unknown

Problems and Projects

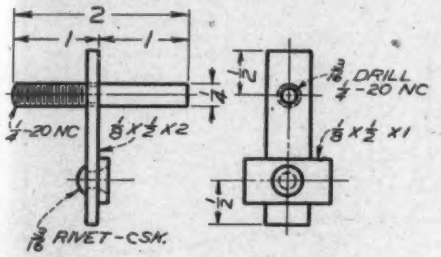
TAP-DIE RIVET EXERCISE

G. L. SIMNICHT
U. S. Navy Air Corps
Chicago, Ill.

No. of pcs.	Material	Size
1	Band iron	⅛ x ½ x 2 in.
1	Band iron	⅛ x ½ x 1 in.
1	Round cold-rolled steel	¼ x 1 in.
1	Roundhead rivet	3/16 x ½ in.
	Lard oil	

Tools

1. Hack saw
2. 3/16-in. and ½-in. twist drills
3. ¼ — 20 N.C. tap and tap wrench
4. ¼ — 20 N.C. die
5. Ball-peen hammer
6. Rule
7. Scriber
8. Center punch
9. Mill file



Procedure

1. With the hack saw cut off one piece of band iron 2 in. long, and another 1 in. long.
2. With the hack saw cut off a piece of ¼ by 2-in. round cold-rolled steel.
3. With the rule and scriber draw a center line lengthwise on each piece of band iron.
4. On the 2-in. piece of band iron locate and center punch to mark the spots for drilling holes.
5. Drill a 3/16-in. hole at each end.
6. Find the center of the 1-in. piece of band iron and mark with center punch. Drill a 3/16-in. hole at this point.
7. Use a ½-in. drill to countersink small piece of iron for riveting.
8. Use ball part of ball-peen hammer to do the riveting.
9. Use mill file to remove surplus rivet stock.
10. Use a ¼-in. tap and tap wrench to put threads in the 3/16-in. hole on opposite end of 2-in. piece of band iron.
11. Use ¼-in. die to put 1 in. of threads on the ¼-in. piece of round iron.
12. Get a small tag and put your name on the exercise before handing in.

MODERN TABLE LAMP

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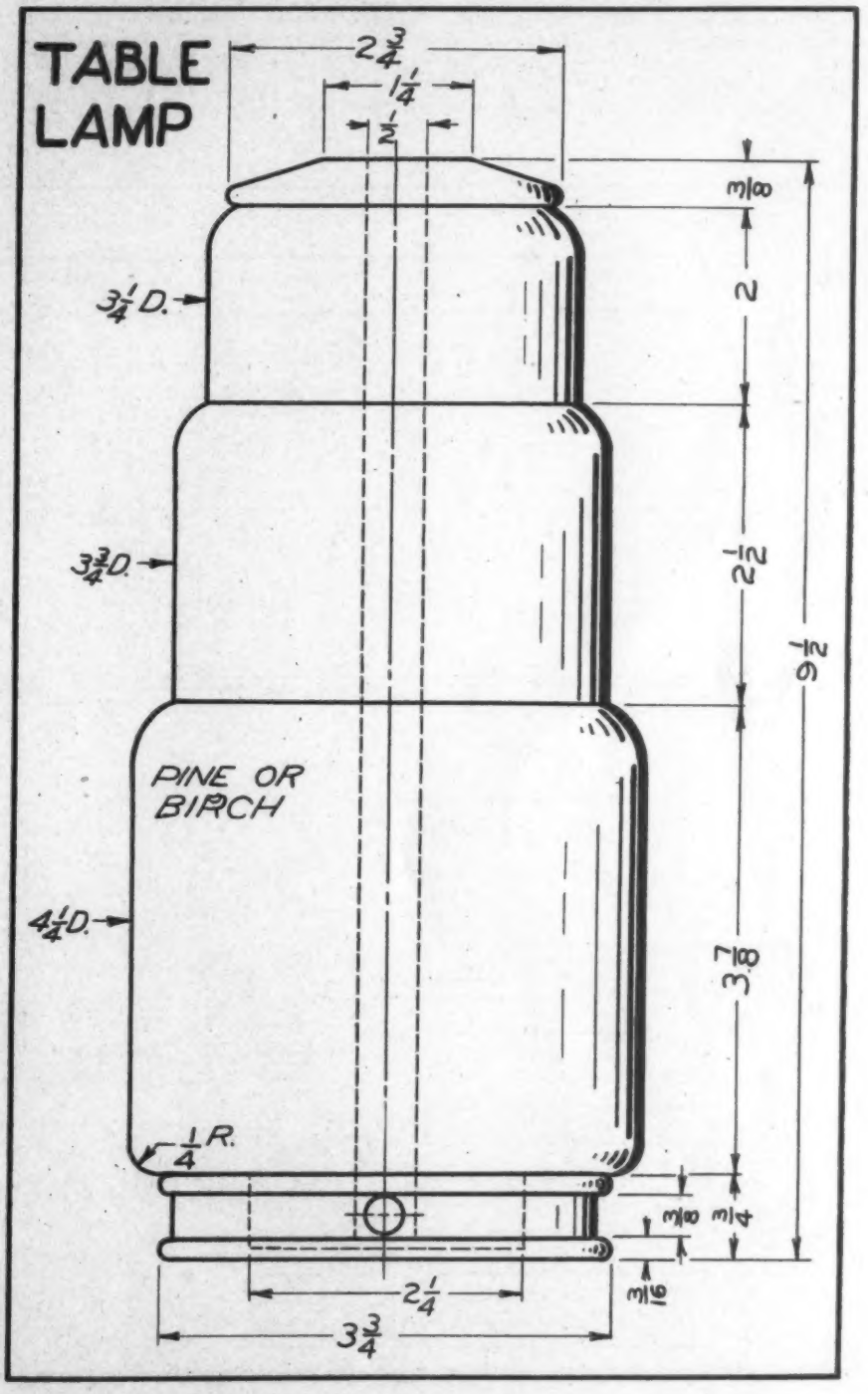
Minneapolis, Minn.

The simple, plain surfaces of this design require a careful selection of the stock, the type of finish, and the shade, as well as good workmanship.

Prepare the surfaces of six pieces of birch or pine ¾ by 4½ by 10 in. Glue them together in two sets of 3 pieces each, making each set 2¼ by 4½ by 10 in. When the glue has set, cut a ½ in. dado ¼ in. deep down the length of one surface on each of the two blocks. Glue the two blocks together, so that the dadoes form a ½ in. square hole through



the length of the lamp block, to use for the running thread or wire.

Cut two pine blocks ½ by ½ by 1 in., to plug both ends of the hole in the large block. Glue these into place, being careful not to break the glue joints on the large piece. Turn the block to the dimensions shown and sand smooth.

Turn the base from a piece of birch or pine ¾ by 4¼ by 4¼ in. to the dimensions and design shown. Cut the hole in the surface to fit the tennon stub on the spindle, which is 2¼ in. in diameter.

Bore a ½-in. hole through the length of the plug in the base of the spindle and glue the base and spindle together before removing the faceplate. Place the entire lamp in the lathe and apply the finish.

For a finish suggested for birch or pine, use thin zinc white mixed with turpentine to the consistency of coffee cream. Do not use linseed oil for a thinner, as oil turns the wood a yellow color. Brush a thick coat of the finish on the surfaces and allow to set for about 10 minutes. Then carefully wipe the paint with a rag, leaving the grain filled. When dry, place the lamp in the lathe and apply a lacquer or French polished finish. Other methods of finishing, of course, may also be used.

After you have applied the finish, bore a ⅜-in. hole through the top plug. Then bore a hole through one side of the base into the spindle hole for the electric wire.

Fasten a cluster fixture to the lamp top. Wire the lamp, using white silk covered wire to the attachment plug. A white cylindrical shade about 10 in. in diameter harmonizes best with the lamp.

HACK-SAW FRAME

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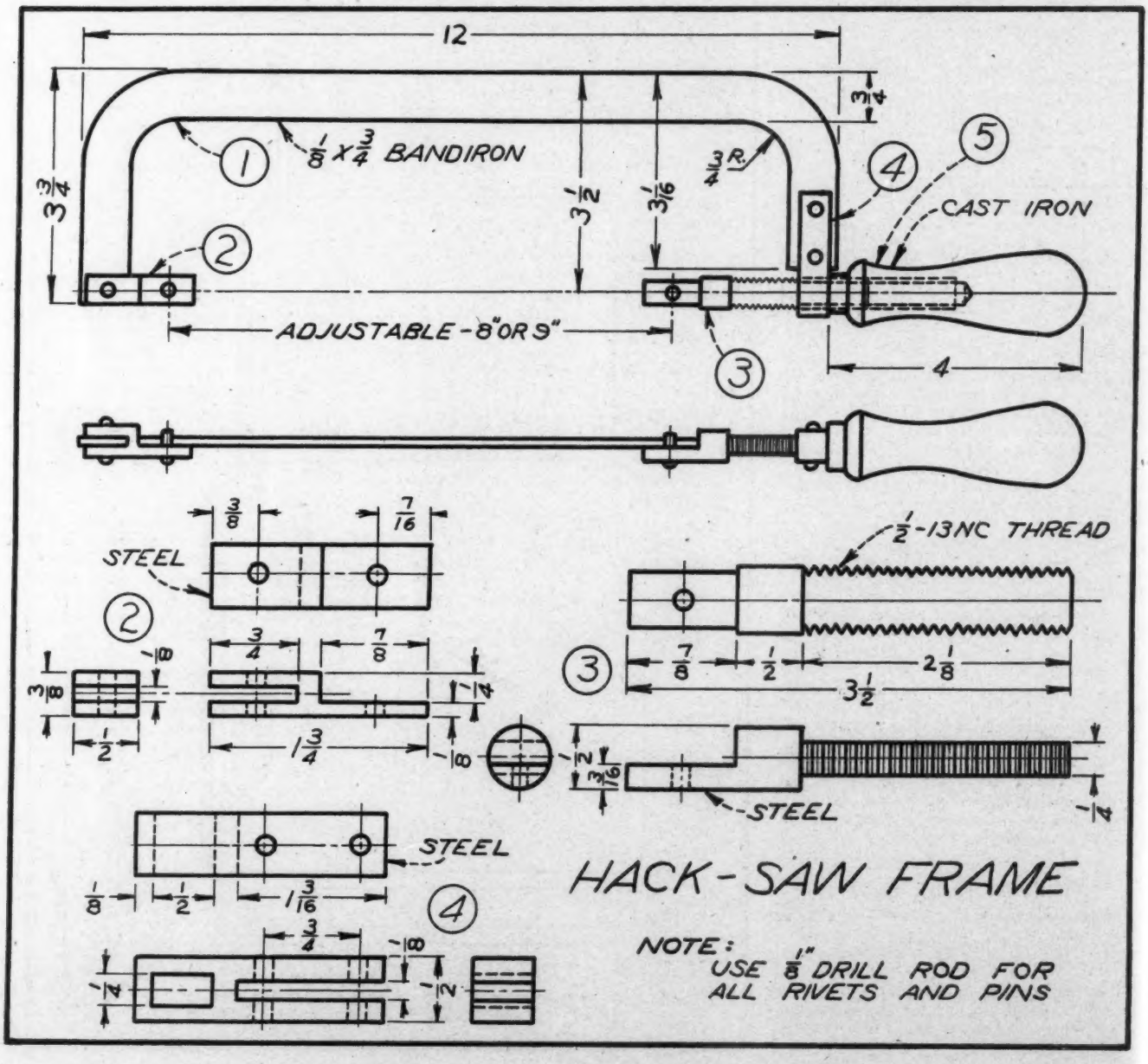
The bends in the frame, Part I, require some care to make, as the material is thin in relation to its width, but the bends can be made if the heat is confined to the spot to be bent and if no attempt is made to bend the piece after it has turned dark.

Part 2 is made entirely in the milling machine, except of course, that the holes are drilled in the drill press.

The threaded portion of Part 3 can be made either in the lathe or with a die. The flats are milled.



The ¼ by ½-in. hole in Part 4 is filed out, starting with two 3/16-in. drill holes. The long slot is cut in the milling machine with a slotting saw, the piece being held vertically in the vise.

The handle may be made of cast iron in the lathe, holding the stock in a chuck. After drilling and tapping the hole to receive Part 3, the piece is turned end for end, turned to form, and cut to length with a parting tool. If a lighter handle is preferred, an ordinary file handle of wood may be used. In this case a threaded ring held with a setscrew will have to be inserted in the handle to engage the threaded portion of Part 3.

TECHNIQUES IN USING THE CIRCULAR SAW

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Names of Parts of Circular Saw

1. Guide Bar
2. Ripping fence
3. Miter attachment
4. Tilting lever
5. Tilting scale
6. Tilting clamp
7. Height clamp
8. Height scale
9. Table
10. Miter gauge slots
11. Guard
12. Guard support arm
13. Saw arbor
14. Inspection plate
15. Saw
16. Pulley

Ripping to Width

1. Measure from saw tooth to gauge for width. Be sure and measure from tooth set toward guide.
2. Raise saw so that it will extend about ⅛ in. above board to be cut.
3. On pieces too thick for the saw to reach through, turn the board over and rip to center.
4. Always *use a push stick* on pieces narrower than full width of your hand.

Crosscutting

1. Use miter attachments to push work into saw.
2. Be sure miter attachment is set for desired angle.
3. Raise saw so that it will extend about ⅛ in. above board to be cut.

Dadoing for Shelves

1. Use miter attachment for pushing to saw.
2. To get complete accuracy use a stop block on the ripping guide and measure from block to saw so that saw kerf will always be in the waste.
3. For depth of cut measure from saw table to top of saw tooth.
4. If it is desired to stop cut before the edge of the board is reached, clamp a block on table in front or behind board so saw will not cut past the edge.

Tenoning

1. Measure from ripping guide to saw, putting saw kerf in the waste, and run the board over the saw with the end that is to receive tenon down toward the table. Repeat for the other side so that all tenons will be of a constant thickness even though stock may vary slightly in thickness.
2. Change to crosscut saw and set ripping guide for length of tenon — putting saw kerf in waste — and raise saw enough to cut through waste stock. Push through with miter attachment.

Straight Grooves in Sides or Edge of Board

1. Measure for depth of cut.
2. Measure from guide saw to locate saw kerf in waste.

Round Groove on Sides or Edge of Board

1. By trial determine an angle that will make saw cut of desired width and depth of groove and clamp guide in place to allow pushing board over saw at an angle.
2. Push board over saw slowly so saw kerf will produce a groove.

THE MARQUETRY TECHNIQUE APPLIED TO CORK

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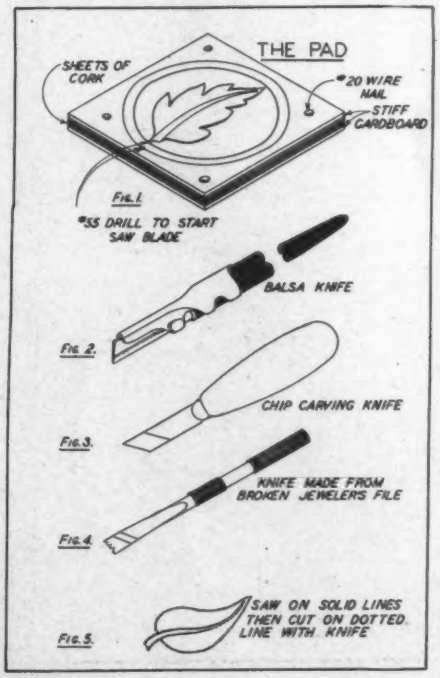
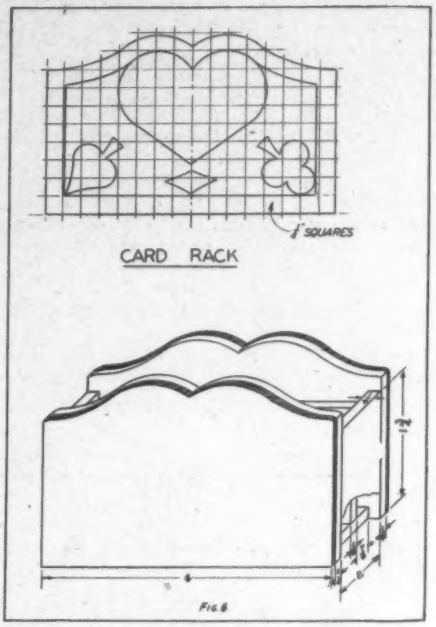
In keeping abreast with modern industrial trends our fine and industrial-arts courses might well turn toward the many new materials being developed, or to the new uses being devised for old materials. These materials may be used alone or more frequently combined with other materials. Cork is one of these older materials that is being used in many new ways, especially in combination with other media. Several recent articles have presented general procedures and suggested projects suitable to corkcraft and need not be repeated here. However, the writer has had such satisfactory results with the *marquetry technique* in working with cork that it is herewith presented and partially illustrated, for the guidance of other teachers.

Designing: Nearly all kinds of designs — abstract, geometric, etc. — may be applied to cork if they are executed in *masses* so that the various areas may be cut out. The motif





may be treated as an applied design such as was used on the card rack, shown in Figure 6, or they may form the entire surface as in the case of the coasters, shown in Figure 7. They may also be used as incised designs.

Making the Pad: After the design is drawn and transferred to a piece of heavy cardboard a pad is made by sandwiching as many sheets of colored cork (or natural cork to be colored after sawing) as there are different colors in the design between two pieces of cardboard, one of which is the one on which the design had previously been transferred. See Figure 1. These sheets are fastened together with nails that are clinched on the back, or the sheets may be cemented together at waste sections (corners, etc.) with rubber cement.

Sawing: Small holes are drilled where needed, to permit starting the saw cut, as indicated in Figure 1, and the pieces are sawed out as in marquetry by sawing the innermost piece out first and working toward the outside. For example, in Figure 1, saw out the vein of the leaf first, then the outline of the leaf, the inner circle, and last, the outer circle.

Very narrow sections are handled best by sawing along the solid lines as illustrated in Figure 5, and later when assembling the pieces cut on the dotted line with a sharp knife such as is shown in Figures 2, 3, and 4. This procedure prevents losing small pieces as well as breaking them when attempting to saw such narrow pieces.

A fine saw blade (.008 × .017 — 70) works well on the cork at 600 to 1000 r.p.m. When cork is cut very little material is removed by the saw, and the compressibility of the cork permits the making of very close joints when the pieces are glued to the backing, with very moderate pressures.

Assembling the Pieces: After sawing, the pieces are assembled so as to form the proper color design. Should natural cork be used, the various pieces should be dyed with colored drawing ink and then assembled. Coloring the edges of part or all of the pieces with black

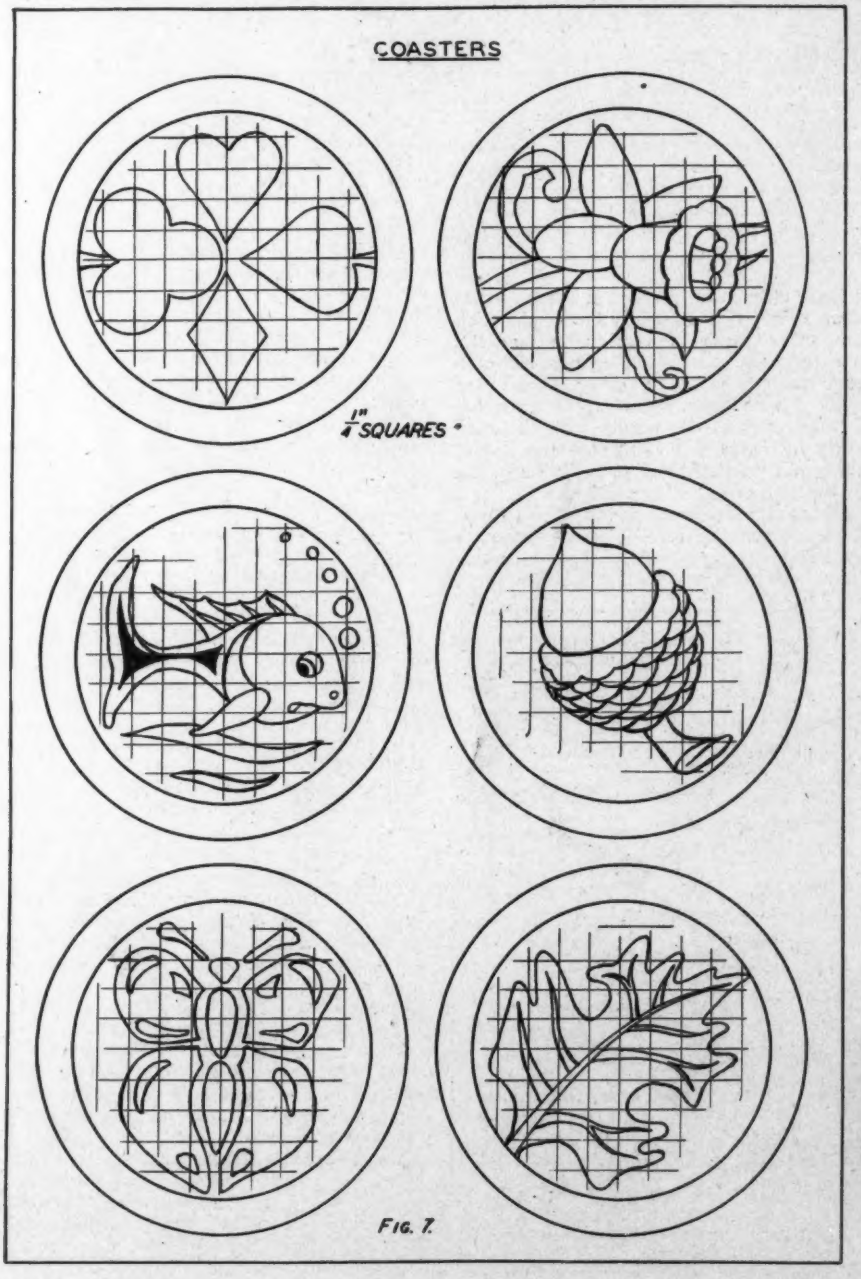
before assembling provides an interesting emphasis of line, and will be found very appropriate for certain designs.

Usually the pieces will not need to be taped together as in the case of marquetry but may be slid from a piece of cardboard onto the backing as the roughness of the material tends to keep the pieces together.

Gluing: The cork is fastened to a backing of plywood, presdwood, etc., with cold liquid glue, casein glue, plastic resin glue or rubber cement applied with pressure in the same manner that wood or other materials are glued together. Cork may be cemented to glass or metal with sodium silicate which is commonly known as waterglass.

Finishing: As cork is used for its own particular texture and as it usually has a wax finish many projects will require no additional finishing. However, a number of techniques may be employed for obtaining special effects. Cork may be finished by applying wax, lacquer, or varnish, but care must be taken to prevent the vehicle of the finishing material from lifting the color. Spraying is most satisfactory except for the wax which may be applied by rubbing.

Interesting coloring effects may be secured by using colored drawing inks, leather dyes, or flexible leather enamels. Blending, and mottled effects may be secured from the inks and dyes by using any one of the several splattered techniques, applying the second color before the first is dry. An airbrush will produce interesting effects as will toning with a spray gun.



THE ABRASIVE TOOLS OF INDUSTRY — PART I

J. E. DONALD HASTIE

Niagara Falls, N. Y.

Industry's abrasive tools may be classified into four groups: grinding wheels; coated abrasive products; polishing grain; and sharpening stones and abrasive sticks.

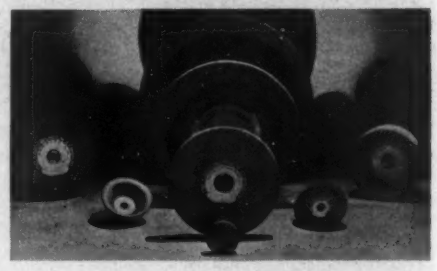


Fig. 1. Grinding wheels

Grinding wheels are basically composed of a combination of abrasive grains and a bonding material or "binder." See Figure 1.

Coated abrasive products are manufactured by applying abrasive grains to an adhesive coated backing of fiber, or to an adhesive coated backing of paper, cloth, or combination. See Figure 2.

Fig. 2. Coated abrasive products

Polishing grains are produced in a wide variety of grain sizes and are used with glue on setup polishing wheels. Other grain types are also mixed with certain carriers for the making of lapping compounds. See Figure 3.

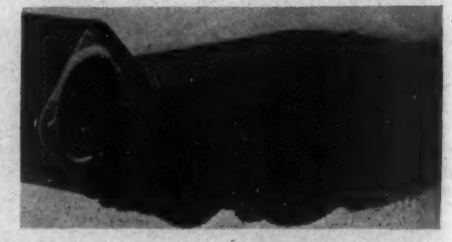


Fig. 3. Polishing grains

Stones and sticks are a composition of abrasive grains and certain bonding materials molded in shapes for sharpening edged tools and other specific industrial uses.

Component Elements of a Grinding Wheel

As grinding wheels are of most importance to industrial production and the most widely used of all abrasive tools, they will be analyzed first. Other abrasive tools will be discussed later.

A summary of the basic component elements which are built into a grinding wheel follows:

1. *Abrasive grain:* This element does the job of cutting.
2. *Bonding material:* This element acts as a *binder* and holds the abrasive grain in the form of a wheel.
3. *Grade:* This element is a measure of the strength with which the bonding material holds abrasive grain particles in the form of a wheel. It is also a measure of resistance offered by the composite strength of bonding material and grain particles to the grinding stresses which operate to tear the grain particles out of the wheel face and wear away the wheel.
4. *Structure:* All grinding wheels are porous to some degree, depending on the size of the built-in pore spaces. Structure is basically the relationship of abrasive grain to bonding material and the relationship of these two elements to the spaces or voids that separate them.

The functions of these four component elements is discussed later.

Types of Abrasive Grain

Natural abrasives such as emery, sandstone, corundum, and quartz are mined and are referred to as "natural" abrasives because they were produced by the *uncontrolled* forces of nature. Because of this lack of control and consequent presence of impurities, the use of natural abrasives has been largely discontinued. For example, emery might contain 65 per cent of abrasive or cutting materials and 35 per cent impurities. These impurities not only hinder the cutting action but tend to create nonuniformity in abrasive wheels manufactured from this natural abrasive.

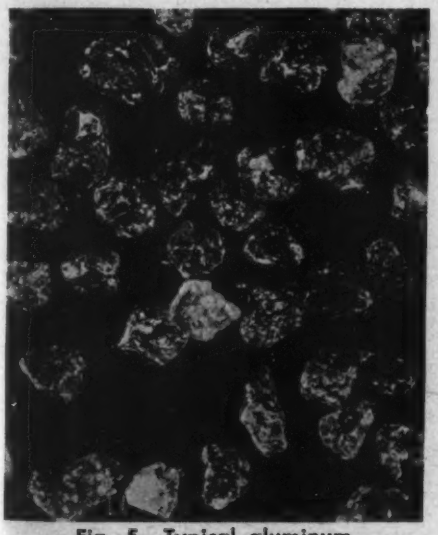


Fig. 5. Typical aluminum oxide grain

Manufactured abrasive materials, fused aluminum oxide and silicon carbide are products of the electric furnace. The methods by which they are produced are *controlled;* hence, the quality and characteristics of these two abrasive types can be changed to meet specific grinding conditions.

Aluminum oxide: This abrasive is a tough, sharp grain whose chemical formula is Al_2O_3. It is the abrasive to use in the grinding or cutting of high tensile strength materials such as alloy steel, high speed steel, annealed malleable iron, and tough bronze.

Silicon carbide. This is a very hard, sharp abrasive grain the chemical formula of which is SiC. It is the abrasive to use in the grinding or cutting of low tensile strength materials such as cast iron, bronze, aluminum, copper, and nonmetallic materials.

A table of trade names applied to *aluminum oxide* by some of the grinding wheel manufacturers follows:

Trade Name	*Manufacturer*
Aloxite	The Carborundum Company
Alundum	The Norton Company
Aluminum Oxide	Macklin Company
Borolon	Abrasive Company

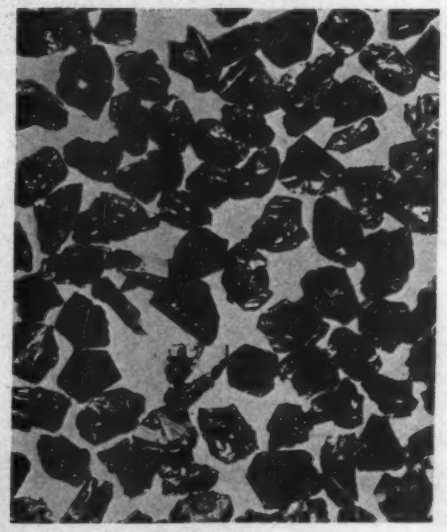


Fig. 6. Typical silicon carbide grain

There is another special form of aluminum oxide which is white in color. It has a tendency to fracture more readily than regular aluminum oxide and thus more new and sharper cutting edges are presented to the work. It is the abrasive to select when grinding hardened tool steels or for use in general toolroom grinding.

A table of trade names applied to this form of *aluminum oxide* by some of the grinding wheel manufacturers follows:

Trade Name	*Manufacturer*
"AA" Aloxite	The Carborundum Company
"38" Alundum	The Norton Company
Natalite "S"	National Grinding Wheel Co.
"WW" Sterlith	Sterling Grinding Wheel Div.

A table of trade names applied to *silicon carbide* by some of the grinding wheel manufacturers follows:

Trade Name	*Manufacturer*
Carborundum	The Carborundum Company
Crystolon	The Norton Company
Silicon Carbide	Macklin Company
Electrolon	Abrasive Company

Another special form of silicon carbide is green in color and is used to grind or resharpen cemented carbide-tipped tools. It has been given the trade name "green-grit" carborundum by The Carborundum Company.

Classification of Grain Sizes

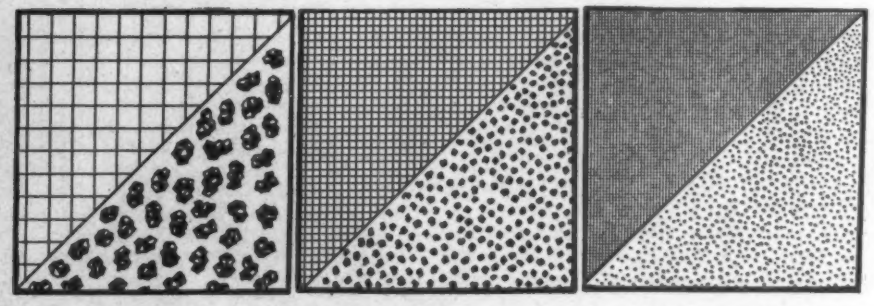
Aloxite comes from the electric furnace in the form of massive pigs — and carborundum comes from the electric furnace in the form of crystal masses. In order to provide the variety of necessary grain sizes, these pigs and crystal masses must be broken up, crushed, and treated. The smaller particles are separated by sifting through screens of various sizes. These sized particles of abrasives are called *grits* or *grains*. The size of these *grains* is expressed by the size of the screen opening through which they are sorted or sifted. The grit sizes thus established are standard throughout the abrasive industry.

For instance, a *grain* or *grit* which goes through a screen 8 meshes or openings per linear inch is called 8-grain size or 8-grit size. A 24-grain size is approximately 1/24 of an inch across, just as an 8-grain size is roughly ⅛ of an inch across, etc.

See Figure 7 for commercial grain sizes.

Silicate bond wheels release the abrasive grains more readily than vitrified bond wheels. They are used for grinding edged tools and where heat generated in grinding must be kept at a minimum.

(To be continued)



Grain size: 8 Grain size: 24 Grain size: 60

Fig. 7. Typical screens through which have been sifted grain sizes, 8, 24, and 60, as illustrated in the above diagram

WOOD AND METAL BREAD SLICING GUIDES

JOSEPH J. LUKOWITZ
Milwaukee, Wis.

A most timely project in great favor with pupils and parents, is the bread slicer. School shop teachers will find many tool processes greatly motivated by this widely accepted project.

The three slicers shown in Figures 1 and 2 are representative of practical bread-slicing guides. It is possible to design a slicer for any grade level. The one shown at A in Figure 1 is extremely simple in construction. Fir plywood is frozen at the present time, but other kinds of plywood are obtainable. Masonite could also be used instead of plywood. Solid wood could be used, too, by making changes in design.

At B in Figure 1 the slicer is shown in use. Perfectly straight slices can be cut by anyone because the knife cannot vary from the perpendicular. The saw cut which guides the knife should be wide enough to allow the knife to slide through freely. If a single saw cut is too narrow, work the saw through the cut at an angle to widen it. It is best to make the saw cut through both side pieces at once by clamping them in the vise in their relative position. Use care in aligning the cuts when assembling. A piece of sheet metal 3 or 4 in. wide and long enough to fit through the slots may be slipped in the slot when assembling to aid in lining up the saw cuts.

At C is shown a slicer with a metal knife guide. Shops still having metal on hand may use it; perhaps an accumulation of short lengths can be salvaged for the project. The holes for the screws should be drilled a snug fit. Use two brads, as shown, to space the guides. The brads will also help to keep the slot even.

At D is shown a simple, but none-the-less efficient slicer. A bench drill or boring jig is necessary here to bore vertical holes for the dowels.

There is absolutely no chance of the knife edge contacting the guiding slot in any of the slicers. The reason for this is illustrated at E. A little instruction for the boys on bread slicing would be in order. Remind them that the bread knife should be used with a sawing motion and that the knife should not be pushed down through the bread.

Metal shops looking for projects requiring little material, or projects for which metal is still available, will find the slicer shown in Figure 2 most timely and valuable in shop training possibilities. It embraces layout, bending, cutting with snips, sawing, drilling, tapping, soldering, and polishing. Not the least important, in view of the ban on the sale of sliced bread, is the fact that the device will be welcomed in most homes because of the

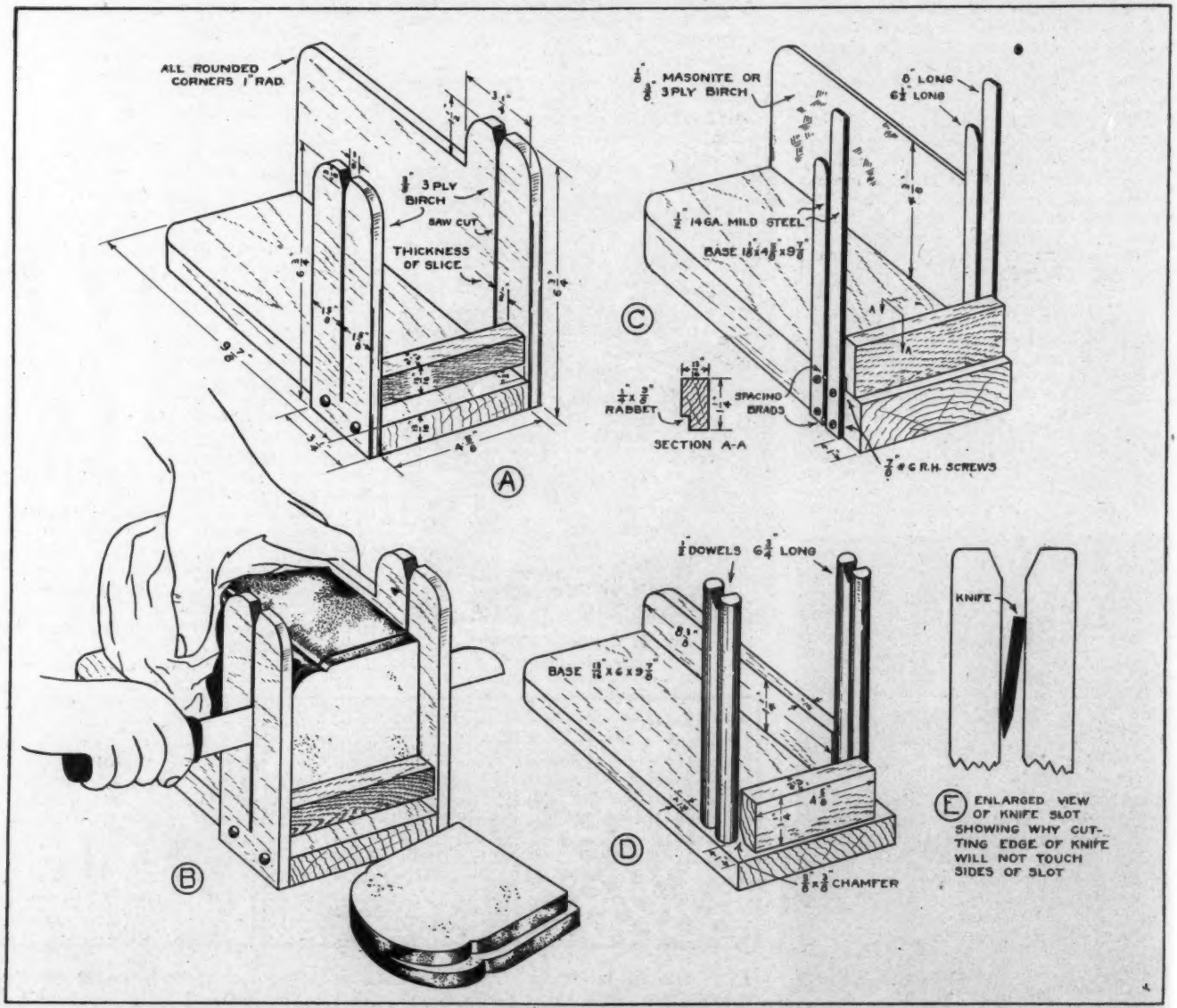


Fig. 1. Bread slicing guides made from wood

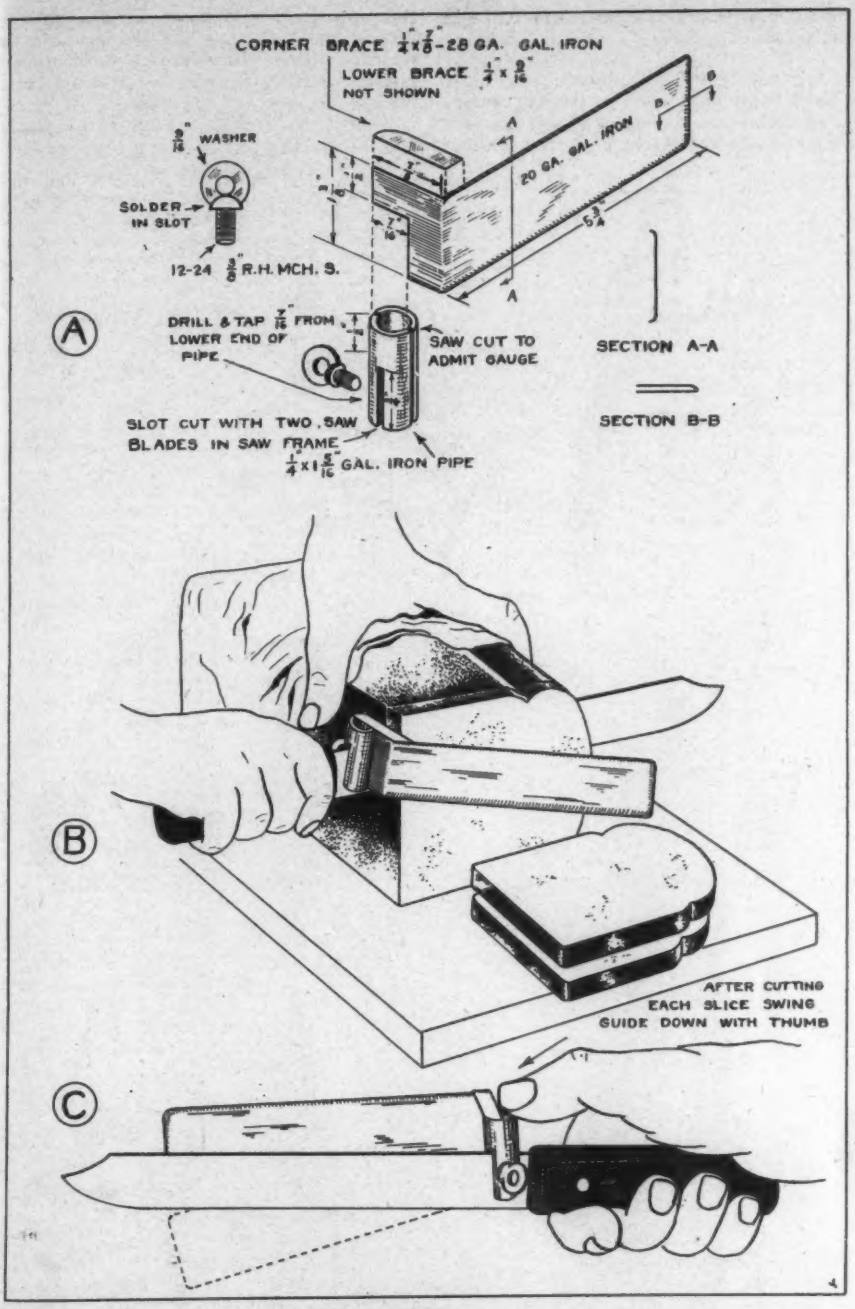

CORNER BRACE 1/4 x 7/8 - 28 GA. GAL. IRON
LOWER BRACE 1/4 x 3/16 NOT SHOWN
3/16" WASHER
SOLDER IN SLOT
12-24 3/8" R.H. MCH. S.
20 GA. GAL. IRON
5 3/4"
A
DRILL & TAP 7/16" FROM LOWER END OF PIPE
SAW CUT TO ADMIT GAUGE
SECTION A-A
SECTION B-B
SLOT CUT WITH TWO SAW BLADES IN SAW FRAME
1/4 x 1 5/16" GAL. IRON PIPE
B
AFTER CUTTING EACH SLICE SWING GUIDE DOWN WITH THUMB
C

Fig. 2. Metal bread slicing guide

difficulty that many people are experiencing in cutting bread evenly.

The device shown at B in Figure 2, when slipped over the back of the knife blade, will make it easy to cut slices of uniform thickness throughout. At A, in Figure 2, the construction details are given. The materials may be salvaged from scrap metal in the tin shop, and from scrap pipe in the plumbing shop. The pipe need not necessarily be galvanized. Black iron pipe can be used. File the pipe clean and polish with emery cloth. After the sheet metal is cut to size and the 7/8-in. bend is made, make four small saw cuts about 1/8 in. long at the two corners and at the 7/8-in. bend. Then bend the three edges over and fill the saw cuts with solder so that the part of the guide which slides against the bread will be smooth and have rounded edges. Cut a piece of pipe as indicated at A and slot it as shown. For an extra thick-bladed knife, use three saw blades in the saw frame to cut the knife slot. If desired, the slot can be tapered to conform to the taper of most knife blades by pinching the pipe in a vise thus making the slot narrower at the bottom.

When inserting the knife in a tapered slot it may be necessary to put the knife in the slot, end first. Use moderate pressure when tightening the setscrew, so that the guide automatically swings up when the guide touches the breadboard. When properly adjusted on a tapered knife blade the guide will be pivoted on the knife blade and will not slide up on the blade. After cutting each slice merely reset the guide as shown at C in Figure 2, by pressing forward with the thumb on top of the pipe as shown. When using the slicing aid the hand should be relaxed. Use only enough side pressure to keep the guide sliding very lightly against the bread. Always use a sawing motion when cutting bread.

A precaution to be observed before soldering the guide to the pipe is to clamp a metal straight edge such as a 12-in. scale in the knife slot, so as to line up the guide with the knife slot. Set the guide 1/2 in. from the scale and then solder in place. Be sure it is parallel to the scale which represents the knife blade. The top and bottom corner braces should then be soldered in place.

COMPETITION AS A TEACHING DEVICE IN THE MACHINE SHOP

STANLEY W. WORTHINGTON
High School
Saranac Lake, N. Y.

During the winter Olympics our school held half-day sessions with half-hour periods. This made it hardly worth while to attempt to do the usual machine work in the shop.

Advantage was taken of the spirit of competition that was in the air to stimulate the students to more care in lathe work. The instructor turned enough pieces to the same size before the classes met, so that each lathe had a piece mounted ready for work, with proper adjustments made for speed and feed. The size of the piece as provided and the required size of the finished piece were written on the blackboard.

The rules of the contest were:

1. That the work be taken down to size in just two cuts.
2. That 1/32 in. be removed in the finishing cut, i.e., chip = 1/64 in.
3. That the chip of the first cut be calculated and set on the cross-feed dial before starting the lathe.
4. That the finishing cut should not be taken until all the work had been carefully measured with a micrometer.

The proper method of calculating the amount of chip of the first cut was taught to the class before starting the competition. When the class was ready to start, the instructor announced that ten minutes would be allowed to make computations and complete the first cut. Upon completion of the first cut by all of the members of the class, a committee of inspectors then measured the diameter of each piece and called it off to the instructor who then wrote it on the blackboard opposite the name of the boy who did the work. Any boy was allowed to repeat the measurement for himself if he felt that the committee had erred in measuring his work. From the size listed on the board, each boy then computed the chip necessary for the finishing cut.

After the finishing cut had been made by each boy, the committee again measured each piece, and as each new measurement was announced it was greeted with approval or

disapproval, depending on how close it came to the required dimension.

Under the stimulus of the competition several members of the class did better and more accurate work than they had ever accomplished before, and improvement in lathe technique was shown by the class as a whole during the weeks that followed the contest.

The same method was employed in turning a piece to a required taper, using tailstock set over to make the taper; and also for a measuring competition using the caliper and steel scale to see how near the boys could come to the measurement obtained with a micrometer. In the latter test several of them were able to come within .003 in. of the true size of a piece, using only calipers and a steel scale graduated to 64ths of an inch.

FACTORS TO CONSIDER IN PURCHASING LUMBER

LOUIS BAROCCI
High School
Cudahy, Wis.

Information Sheet

When ordering lumber one must consider both grades and texture of the material to be ordered.

Grades are defined by rules accepted and published by the several associations representing the manufacturers of lumber. These rules are and must be flexible to the extent of definition and limitations of defects or imperfections within each grade.

Texture will vary considerably in timber of the same kind due to growth under different soil and climatic conditions. For instance, oak grown on the highlands is of slower growth, produces a softer texture and more uniform color, and has fewer coarse defects than the fast-growing timber of the lowlands.

Grading Rules

The National Hardwood Lumber Association defines grades on hardwood lumber as follows:

Firsts and seconds: Sold as one grade FAS.

No. 1 Common and select: Sold as No. common and select.

Number 2 Common.

Number 3 Common.

White Pine

B and Better is the highest grade manufactured in white pine, and is a combined grade of No. 1 Clear and No. 2 Clear. It grades practically free of defects on the face side and is suitable for the highest type finish work.

C Select is a high type finish grade and contains no defects that will not permit its use in full width and length. As a whole the stock will be clear on at least one face.

D Select. This grade is between the finish grade of C Select and No. 1 Common. It has a general appearance of the better grade except that the defects are more general; however, they are not of such a serious nature as to prevent its being a very acceptable grade for cabinetwork.

No. 1 Shop. This grade is not a finish grade. It contains scattered defects which will cut out and produce clear cuttings in sizes from 3 to 12 in. in width and from 3 to 10 ft. in length.

Kiln Drying

The process and reason for the kiln seasoning of lumber are familiar to many, but very few realize the importance of proper methods and the serious effects resulting from improper drying. Nature has not offered us a standard article with which to work; consequently, there is no formula for perfect drying.

Wood in its natural state contains moisture and the problem of kiln drying is the removal

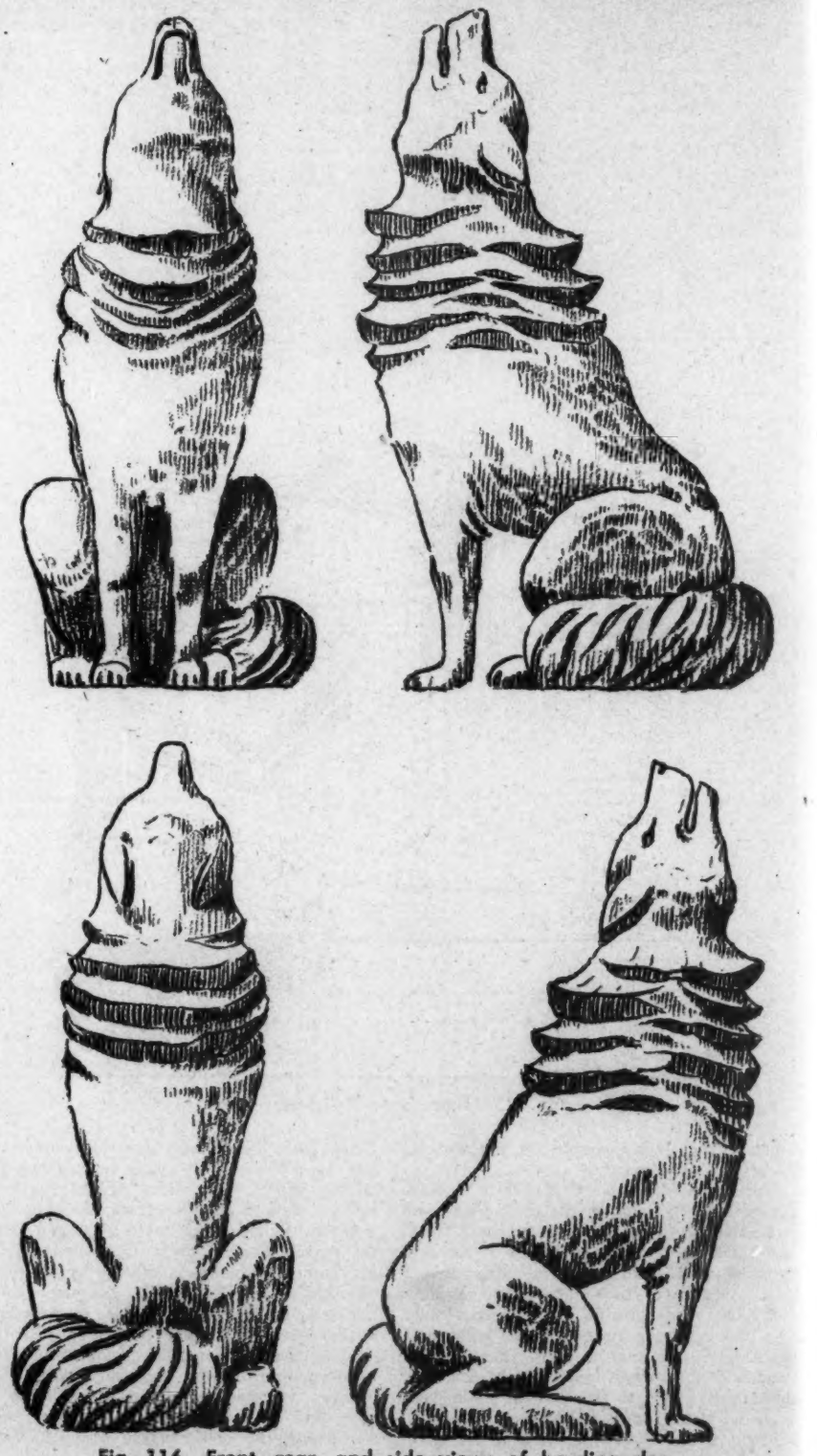


Fig. 116. Front, rear, and side views of howling dog

of this water through a controlled system of evaporation, utilizing heat, humidity, and air circulation.

Proper drying depends largely upon the knowledge and experience of the kiln operator, knowledge of the botanical structure of the wood, and a keen appreciation of the moisture existing in the lumber entering the kiln, and the experience to control conditions necessary to properly dry the lumber.

Kiln drying is a positive means of seasoning lumber to a definite and known moisture content.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT

Hales Corners, Wis.

(Continued from page 142 of the March, 1943, issue)

Howling Dog

A piece of wood 1¾ by 3 by 4⅜ in., with the grain running the long way, is required for whittling out the dog shown in Figures 116 and 117. The one shown here was whittled out of a piece of mahogany but any light wood will do.

Fig. 117. The howling dog

Draw the outline on the block and cut out the silhouette in the usual way. Notice that the tail projects ½ in. from the left side of the dog. Before starting to rough out the figure, cut ½ in. off the upper left side of the dog, leaving the part for the tail stand. Then start blocking or roughing out. No base has been left on this piece, which makes the lower part much easier to whittle. The ruff or hair around the neck and the tail has been left quite simple, and the figure has been left with the knife cuts showing. If you wish you can sand your dog, but the figure has a more rugged appearance, which is more in keeping for a dog of this kind, when the knife cuts are allowed to show.

As far as finishing goes, the wood may be left in its natural state, or it may be given a few coats of wax to prevent soiling. A glossy finish will not improve this carving.

INVENTORY SHEET

LOUIS BAROCCI

High School

Cudahy, Wis.

Woodworking Department

Room No. ..... Teacher..... Date.....

.... Power saw .... Gluepot
.... Jointer .... Bar clamps
.... Band saw .... C clamps
.... Wood lathe .... Hand clamps
.... Sanding machine

Power Saws

.... Ripsaw, 12 in.
.... Ripsaw, 10 in.
.... Crosscut, 10 in.
.... Dado outside, 10 in.
.... Dado inside, 10 in.

Band Saws

.... ½-in. band saw
.... ⅜-in. band saw
.... ¼-in. band saw
.... Jointer knives
.... Miter box
.... 2-ft. steel rules (folding)
.... Yard sticks — steel
.... File handles (patented)
.... Sloyd knives .... Bench dogs
.... Nippers .... Try squares
.... Spoke shaves .... Jack planes
.... Framing squares .... Jointer planes

Screw Drivers

.... 4 in.
.... 6 in.
.... 8 in.

.... Marking gauges .... Finishing planes
.... Hammers .... Mallets
.... Burnisher .... Auger braces
.... Floor brushes .... Pliers
.... Desk brushes .... Wrenches
.... Workbenches .... Outside calipers
.... Inside calipers

Saws (Hand)

.... Ripsaws .... Compass saw
.... Crosscut .... Hack saw
.... Backsaws

Bits Auger

.... No. 16 .... No. 12 .... No. 8
.... No. 15 .... No. 11 .... No. 7
.... No. 14 .... No. 10 .... No. 6
.... No. 13 .... No. 9 .... No. 5
.... No. 4

Chisels

.... 1 in. .... ½ in.
.... ¾ in. .... ¼ in.
.... ⅛ in.
.... Scrapers .... Nail sets
.... Files (mill) .... Center punch
.... Files (cabinet) .... Metal alphabets
.... Saw sets .... Metal numerals
.... Emery wheel dresser
.... Combination square
.... Cabinet scrapers
.... Wood-turning tools

Brads

.... lb. 1¾ in. .... 1 in.
.... lb. 1½ in. .... ¾ in.
.... 1¼ in. .... ½ in.

Nails

.... lb. 8*d*. common .... lb. 6*d* common
.... lb. 8*d*. finishing .... lb. 6*d*. finishing

Sandpaper

.... Quire No. 1½ .... Quire No. ½
.... Quire No. 1 .... Quire No. 0
.... Quire No. 2/0

Miscellaneous and Omitted Items

1 .....
2 .....
3 .....
4 .....
5 .....
6 .....
7 .....
8 .....

Gimlet Bits

.... No. 6
.... No. 4
.... Expansion bits
.... Coping-saw frames
.... Coping-saw blades
.... Radio drills
.... Yankee drills
.... Putty knives

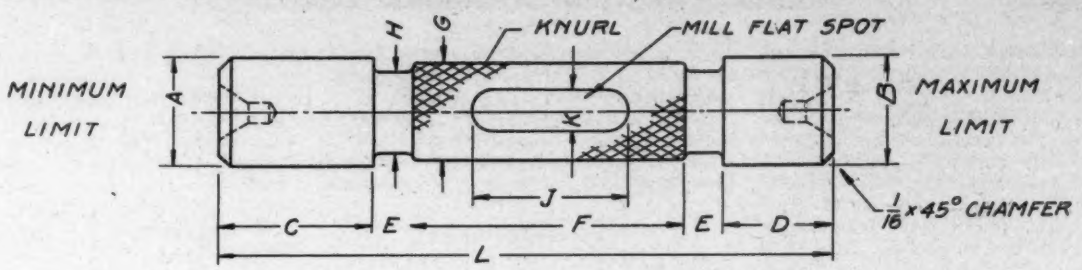
Screws f.h.b.

.... Gross 3-in. No. 12 f.h.b.
.... Gross 2½-in. No. 10 f.h.b.
.... Gross 2-in. No. 10 f.h.b.
.... Gross 1¾-in. No. 10 f.h.b.
.... Gross 1½-in. No. 10 f.h.b.
.... Gross 1¼-in. No. 8 f.h.b.
.... Gross 1-in. No. 8 f.h.b.
.... Gross ¾-in. No. 8 f.h.b.
.... Gross ½-in. No. 6 f.h.b.

Screws r.h.blued

.... Gross 2-in. No. 10 r.h.b.
.... Gross 1¾-in. No. 10 r.h.b.
.... Gross 1½-in. No. 10 r.h.b.
.... Gross 1¼-in. No. 8 r.h.b.

(Continued on page 18A)



PLUG GAUGES ~ DOUBLE END

SELECT NEAREST NOMINAL SIZE

NOMINAL SIZE	C	D	E	F	G	H	J	K	L
.375	1/2	3/8	1/8	1 5/8	1/4	3/16	1	1/8	2 3/4
.4062	17/32	13/32	1/8	1 5/8	1/4	3/16	1	1/8	2 13/16
.4375	9/16	7/16	1/8	1 3/4	5/16	1/4	1 1/8	1/8	3
.4687	5/8	7/16	1/8	1 3/4	3/8	5/16	1 1/8	1/8	3 1/16
.500	11/16	1/2	1/8	1 7/8	3/8	5/16	1 1/4	3/16	3 5/16
.5312	3/4	1/2	3/16	1 7/8	7/16	3/8	1 1/4	3/16	3 1/2
.5625	25/32	17/32	3/16	2	7/16	3/8	1 3/8	3/16	3 11/16
.5937	13/16	9/16	3/16	2 1/8	1/2	7/16	1 1/2	3/16	3 7/8
.625	7/8	9/16	3/16	2 1/4	1/2	7/16	1 1/2	1/4	4 1/16
.6562	29/32	19/32	3/16	2 5/16	9/16	1/2	1 1/2	1/4	4 3/16
.6875	15/16	5/8	1/4	2 5/16	9/16	1/2	1 1/2	1/4	4 3/8
.7187	1	11/16	1/4	2 7/16	5/8	9/16	1 5/8	1/4	4 5/8
.750	1	11/16	1/4	2 7/16	5/8	9/16	1 5/8	1/4	4 5/8
.7812	1 1/16	3/4	1/4	2 9/16	5/8	9/16	1 3/4	1/4	4 7/8
.8125	1 1/16	3/4	1/4	2 11/16	11/16	5/8	1 7/8	1/4	5
.8437	1 1/8	3/4	5/16	2 3/4	11/16	5/8	1 7/8	5/16	5 1/4
.875	1 3/16	13/16	5/16	2 3/4	3/4	11/16	1 7/8	5/16	5 3/8
.9062	1 1/4	13/16	5/16	2 15/16	3/4	11/16	2	5/16	5 5/8
.9375	1 1/4	13/16	5/16	2 15/16	13/16	11/16	2	5/16	5 5/8
.9687	1 5/16	7/8	5/16	3 1/16	13/16	11/16	2	5/16	5 7/8
1.000	1 3/8	7/8	3/8	3 1/8	7/8	3/4	2 1/8	5/16	6 1/8
1.0312	1 7/16	15/16	3/8	3 1/8	7/8	3/4	2 1/8	3/8	6 1/4
1.0625	1 1/2	1	3/8	3 1/4	15/16	13/16	2 1/4	3/8	6 1/2
1.0937	1 1/2	1	3/8	3 1/4	15/16	13/16	2 1/4	3/8	6 1/2
1.125	1 9/16	1	7/16	3 5/16	1	7/8	2 1/4	7/16	6 3/4
1.1875	1 5/8	1 1/8	7/16	3 1/2	1	7/8	2 3/8	7/16	7 1/8
1.250	1 3/4	1 1/8	7/16	3 3/4	1 1/16	15/16	2 3/8	7/16	7 1/2

Plug gauge dimension chart, submitted by William A. DeVette, Technical High School, Erie, Pa.

WHAT ARE THE DESIGN ELEMENTS IN THIN METAL?

1. The designer must recognize and use the plastic nature of metals.

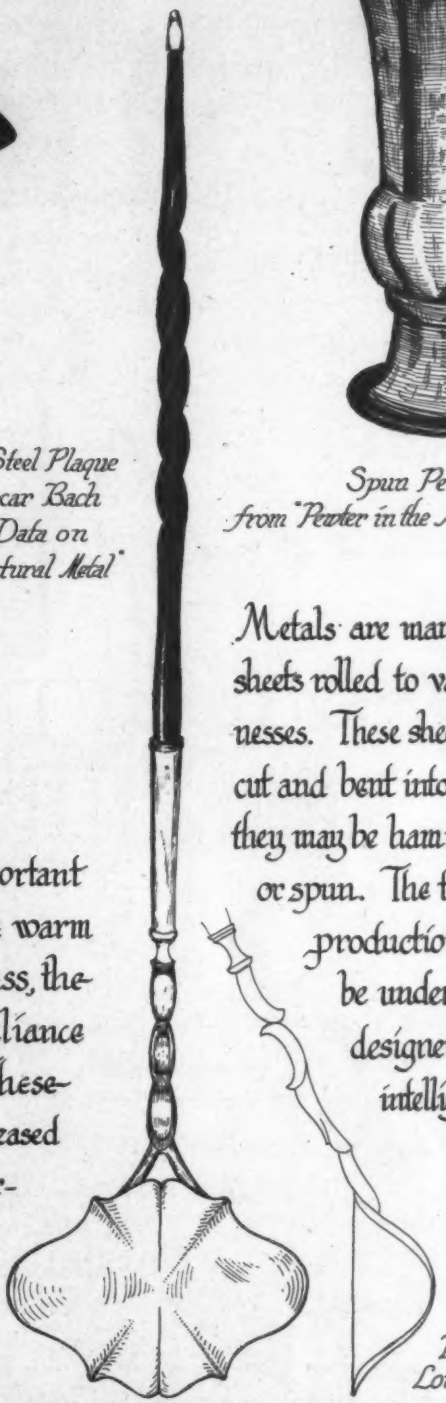
Covered Silver Pitcher
Georg Jensen

Spun Pewter Vase
from "Pewter in the Netherlands"

Stainless Steel Plaque
by Oscar Bach
from "Data on Architectural Metal"

Metals are manufactured in sheets rolled to various thicknesses. These sheets may be cut and bent into shape, or they may be hammered, drawn, or spun. The technique of production should be understood if the designer is to work intelligently.

2. Color and texture of metals are important design features. Colors range from the warm red brown of copper, the yellow of brass, the grays of lead and tin, to the cool brilliance of aluminum, steel, monel, and silver. These colors may be altered and the range increased by oxidation. Surfaces may be mirror-like, or may be given various scratch brush or buffed treatments.

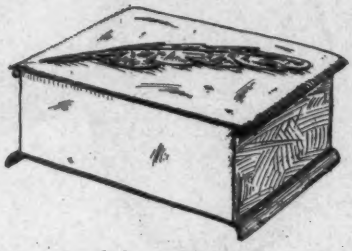


Silver Punch Ladle with Ebony Handle
Thomas Heming
London, 1750

Plate 16. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

THIN GAUGE METAL (Continued)

Techniques of construction and ornamentation employed by the designer



Thin Metal Cut and Bent

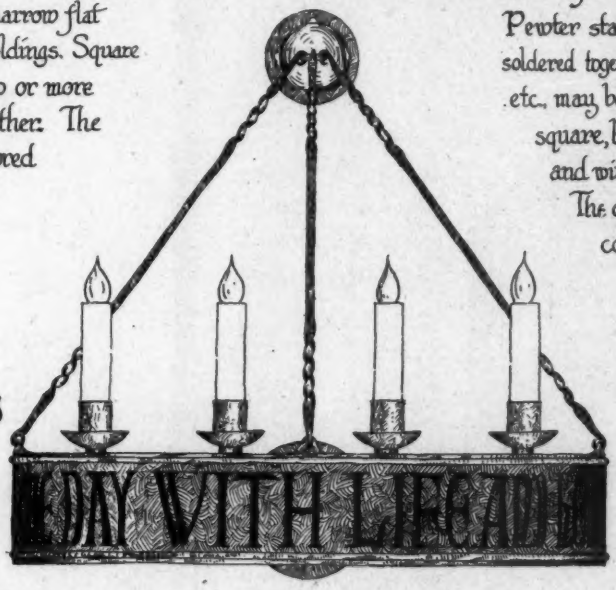
One piece of very thin brass cut with scissors

Molding and Vitreous Enamel

Silver powder box with narrow flat bands twisted to form moldings. Square strips may be used, or two or more round wires twisted together. The top is decorated with colored vitreous enamel.

Contrasting Colors, Panel Construction

Pewter stamp box made of flat sheets soldered together. Boxes, vases, teapots, etc., may be made with panels in square, hexagonal, or other shapes, and with straight or curved sides. The quill is in copper to provide contrast.



Piercing and Sawing

Iron wall light with inscription formed by sawing out the letters which may be left open or backed with colored cloth.

Etching

Copper book end with first colophon etched to a slight depth.

Engraving

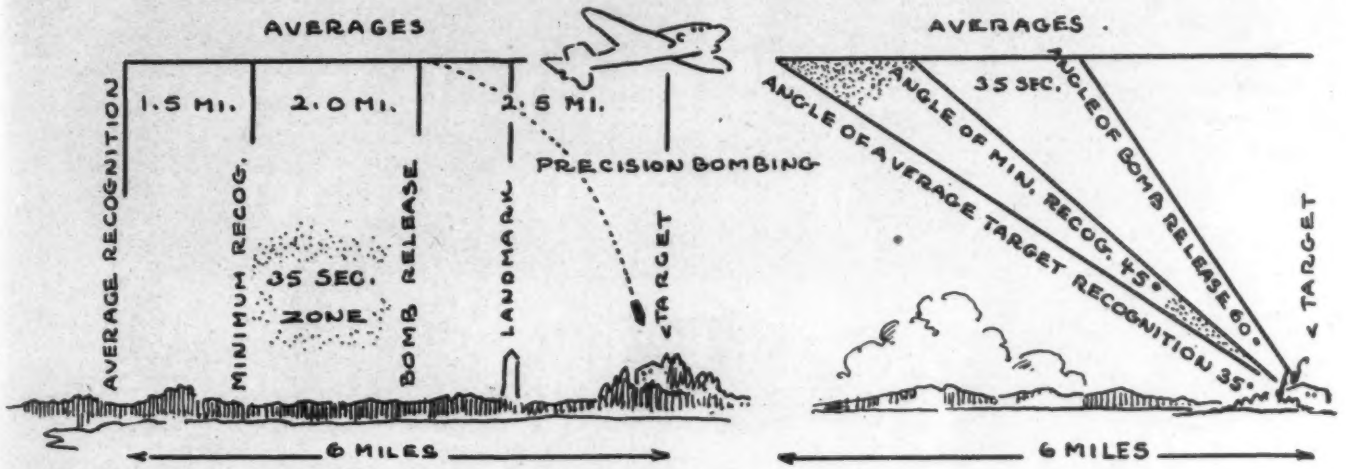
Silver tobacco box by Henry Cowper, London, 1792, with engraved bands.

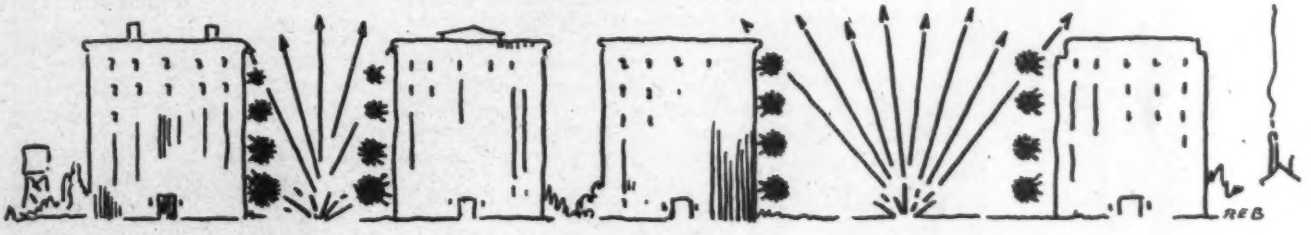
(Wyler)

Plate 17. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

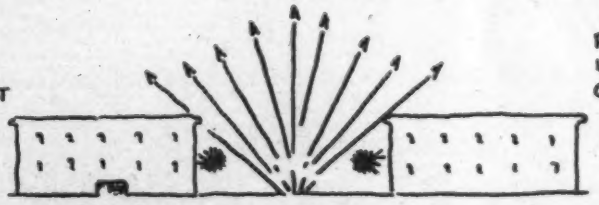
Camouflage Bombardment

WHY CAMOUFLAGE KNOWN TARGETS ? THE CAMOUFLEUR'S OBJECTIVE IS TO CONCEAL FROM THE SEEING EYE OF THE BOMBARDIER AND THE MECHANICAL EYE OF THE AERIAL CAMERA. BOMBERS RELY A GREAT DEAL ON LANDMARKS WHICH MUST BE SPOTTED 5 OR 6 MILES IN ADVANCE. THE BOMBARDIER HAS ONLY 35 SEC. FOR BOMB-SIGHT OPERATION AT AN AVERAGE SPEED OF 3-4 M.P.MIN. CAMOUFLAGING MAY NOT ALWAYS CONCEAL BUT IT MAY CONFUSE THE BOMBARDIER TO THE EXTENT OF CAUSING HIM TO MISS HIS MARK.





IN DIVE BOMBING THE PILOT MANEUVERS DOWN TO ABOUT 5,000 FT. DIVES, RELEASES BOMB AT ABOUT 1,000 FT. AND CLIMBS UP.



AREA BOMBING BY MANY PLANES IS NOT PROFITABLE UNLESS THE AREA CONCERNED CONTAINS MANY TARGETS OF IMPORTANCE

THE FORCE OF EXPLOSION IS IN RELATION TO THE SPACE OF CONFINEMENT AND TO THE RESISTING SURFACE. ABOVE, THE SIZES OF THE SPOTS SHOW THE FORCE OF EXPLOSION EXERTED AND INDICATE THAT LOWER BUILDINGS, WIDELY SPACED ARE LESS VULNERABLE TO BOMBARDMENT.

Plate 3. Camouflage course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

Camouflage Shadows

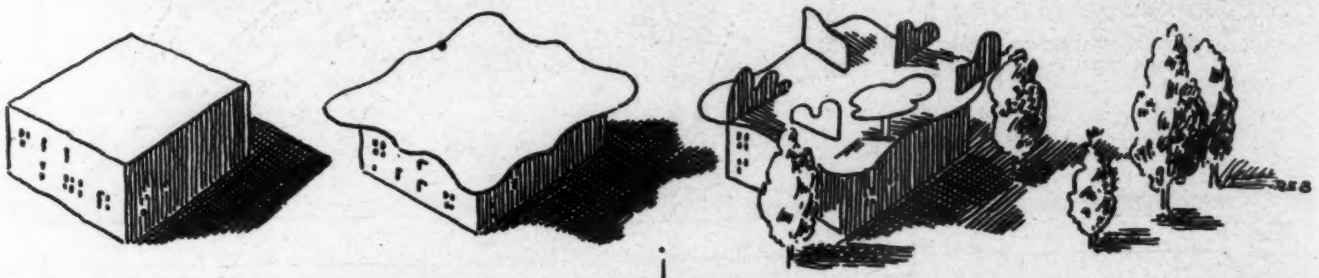
THE OBJECTIVE OF THE CAMOUFLEUR IS TO MAKE THE OBJECT DIFFICULT TO FIND, DIFFICULT TO HIT AND UNPROFITABLE TO BOMB. SHADOWS ARE OFTEN MORE OBVIOUS THAN THE OBJECT: THEY MAY BE DISTORTED, BROKEN, BLENDED, IMITATED.

GEOMETRICAL FORMS AND SHADOWS ARE EASILY SPOTTED

• DISRUPTIVE PATTERN CONFUSES BUT THE SHADOW REMAINS

• IRREGULAR DARK AND LIGHT PATTERN HELP DISTORT SHADOW

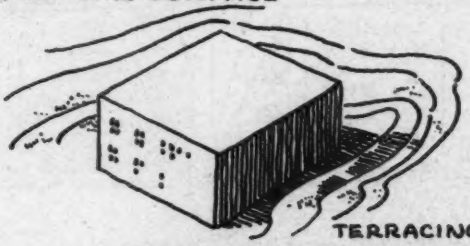
• TREES AND SHRUBS CAN AID IN DISTORTING SHADOW



EASILY SPOTTED FROM AIR • CURVED ROOFS DISTORT THE RIGID LIGHT & SHADE

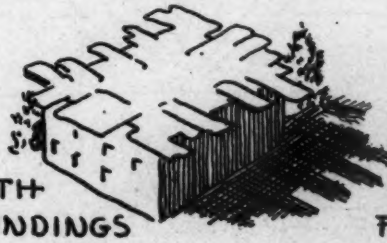
IRREGULAR SLABS RAISED ABOVE A ROOF AID IN DISTORTING THE SURFACE

NETS HELP TO DISSOLVE AND CONFUSE REGULAR SHADOWS



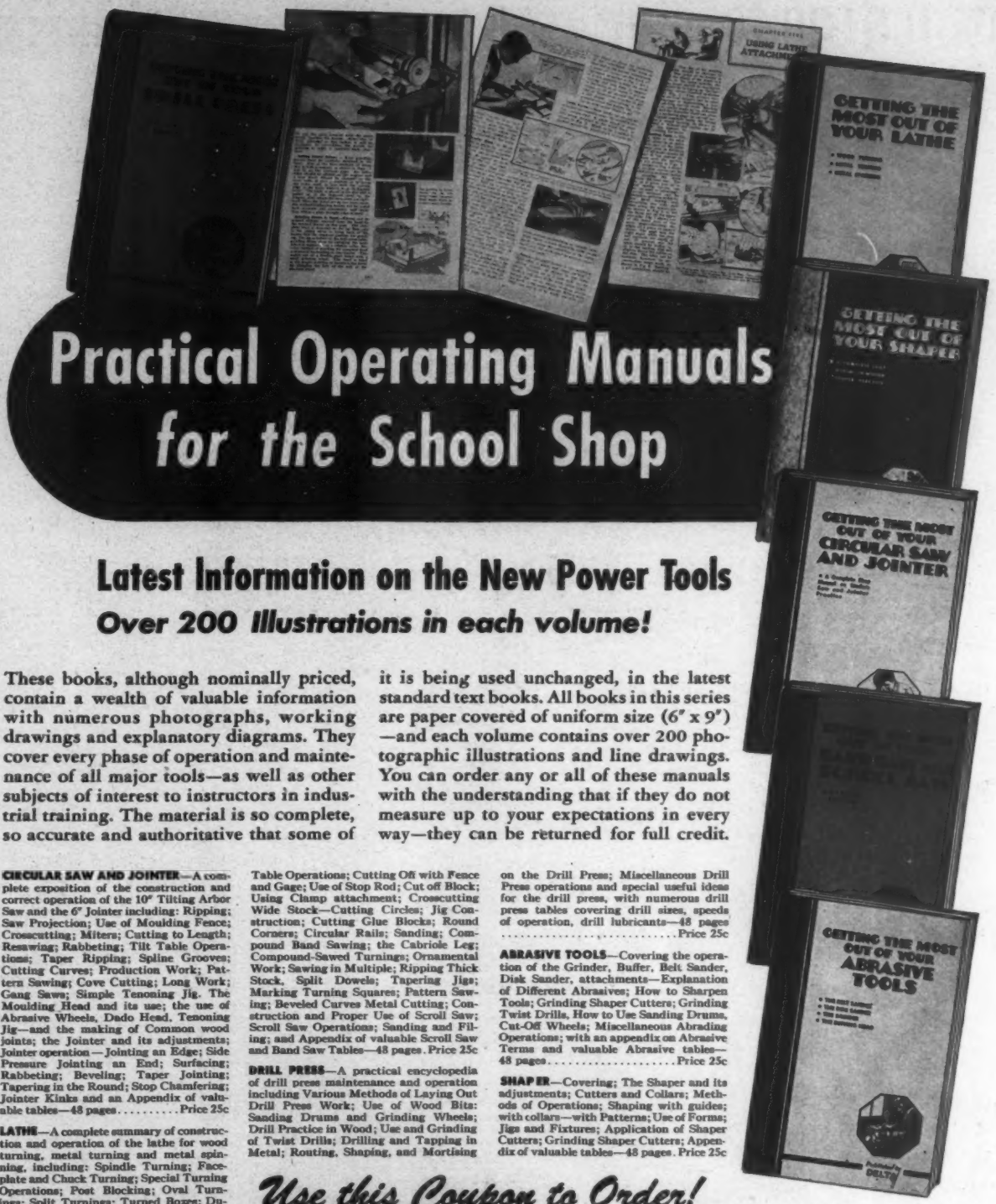
TERRACING AND GRADING SHORTEN GEOMETRIC FORM

IRREGULAR SPACED SLABS BREAK CONTOUR



NATURE'S FORMS MAY BE AN INSPIRATION TO CREATE DISRUPTIVE PATTERN. THE IRREGULAR OUTLINES OF THE BUTTERFLY AND THE MOTH ARE PERFECT EXAMPLES OF BLENDING WITH SURROUNDINGS FOR PROTECTION.

Plate 4. Continuation of camouflage course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.


GETTING THE MOST OUT OF YOUR LATHE
GETTING THE MOST OUT OF YOUR SHAPER
GETTING THE MOST OUT OF YOUR CIRCULAR SAW AND JOINTER
GETTING THE MOST OUT OF YOUR ABRASIVE TOOLS

Practical Operating Manuals for the School Shop

Latest Information on the New Power Tools

Over 200 Illustrations in each volume!

These books, although nominally priced, contain a wealth of valuable information with numerous photographs, working drawings and explanatory diagrams. They cover every phase of operation and maintenance of all major tools—as well as other subjects of interest to instructors in industrial training. The material is so complete, so accurate and authoritative that some of it is being used unchanged, in the latest standard text books. All books in this series are paper covered of uniform size (6" x 9")—and each volume contains over 200 photographic illustrations and line drawings. You can order any or all of these manuals with the understanding that if they do not measure up to your expectations in every way—they can be returned for full credit.

CIRCULAR SAW AND JOINTER—A complete exposition of the construction and correct operation of the 10" Tilting Arbor Saw and the 6" Jointer including: Ripping; Saw Projection; Use of Moulding Fence; Crosscutting; Miters; Cutting to Length; Resawing; Rabbeting; Tilt Table Operations; Taper Ripping; Spline Grooves; Cutting Curves; Production Work; Pattern Sawing; Cove Cutting; Long Work; Gang Saws; Simple Tenoning Jig. The Moulding Head and its use; the use of Abrasive Wheels, Dado Head, Tenoning Jig—and the making of Common wood joints; the Jointer and its adjustments; Jointer operation—Jointing an Edge; Side Pressure Jointing an End; Surfacing; Rabbeting; Beveling; Taper Jointing; Tapering in the Round; Stop Chamfering; Jointer Kinks and an Appendix of valuable tables—48 pages.....Price 25c

LATHE—A complete summary of construction and operation of the lathe for wood turning, metal turning and metal spinning, including: Spindle Turning; Faceplate and Chuck Turning; Special Turning Operations; Post Blocking; Oval Turnings; Split Turnings; Turned Boxes; Duplicate Turning; Spiral Turnings; Hollow Spirals; Fluting and Reeding; Use of Lathe attachments; Jigs and Fixtures; Wood Finishing; metal Turning Operations; Spinning Equipment; Methods of Working; Special Spinning Chucks and Appendix Containing Tap Drill Sizes; Polishing Materials; Decimal Equivalents; Table of Taper Cuts; Grinding Angles for Wood Turning Tools; Grinding Angles for Metal Turning Tool Bits; Lathe Speeds—48 pages.....Price 25c

BAND SAW AND SCROLL SAW—Complete information on band saw blades; Methods of Working including: Ripping and re-sawing; Use of Standard Fence; The Ripping Blade; Ripping Curves; Tilt Table Operations; Cutting Off with Fence and Gage; Use of Stop Rod; Cut off Block; Using Clamp attachment; Crosscutting Wide Stock—Cutting Circles; Jig Construction; Cutting Glue Blocks; Round Corners; Circular Rails; Sanding; Compound Band Sawing; the Cabriole Leg; Compound-Sawed Turnings; Ornamental Work; Sawing in Multiple; Ripping Thick Stock, Split Dowels; Tapering Jigs; Marking Turning Squares; Pattern Sawing; Beveled Curves Metal Cutting; Construction and Proper Use of Scroll Saw; Scroll Saw Operations; Sanding and Filing; and Appendix of valuable Scroll Saw and Band Saw Tables—48 pages. Price 25c

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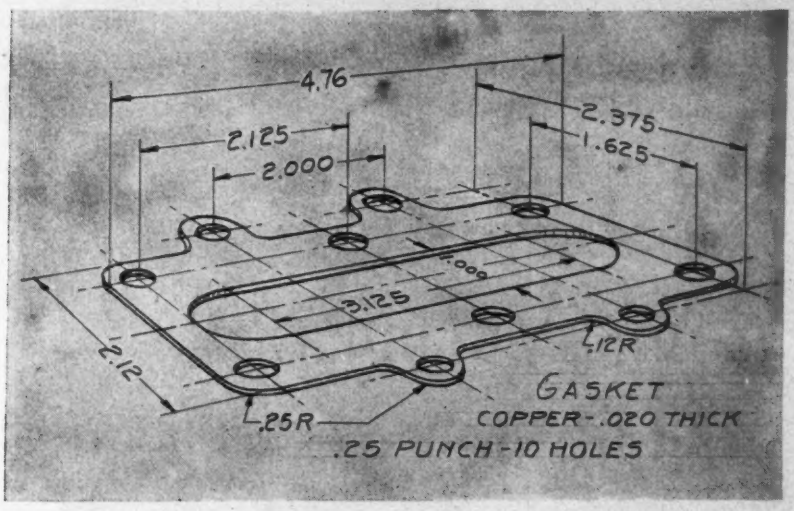

PROBLEM: Ask your students to draw the correct orthographic views of this gasket. *Typhonite* ELDORADO degrees recommended: 2H and 3H.

SOLUTION: We'll send you a free blueprint showing the problem's solution if you write to address at right within 30 days, specify Blueprint No. 128-J4.

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TYPHONITE

ELDORADO

SCHOOL BUREAU, PENCIL SALES DEPT., JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.

(Continued from page 177)

.... Gross 1-in. No. 6 r.h.b.

Screws r.h.brass

.... Gross 1¼-in. No. 10 r.h.b.
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Wood-Finishing Materials

.... Turpentine
.... Linseed oil
.... Wax
.... Oak stain
.... Walnut stain
.... Mahogany stain
.... Kerosine
.... Shellac
.... Hide glue
.... Filler
.... Stick shellac

Lumber Inventory

Lumber

.... Fir panel
.... Oak panel
.... Walnut panel
.... Basswood 1 in.
.... Basswood ½ in.
.... Pine 13/16 in.
.... Oak 2 in.
.... Walnut 12/16 in.
.... Walnut 2 in.
.... Poplar 13/16 in.
.... Poplar ¼ in.
.... Mahogany 1 in.
.... Hickory
.... Ash
.... Gumwood
.... Birch
.... Maple

Drafting

Drafting Room No. .....Teacher.....
.... Instructor's bench
.... Student benches
.... Stools
.... Drafting sets (complete)
.... Drafting sets (not complete)
.... Paper cutter
.... Drafting boards
.... T Squares

Triangles

.... 30–60-deg. triangles
.... 45-deg. triangles
.... Scales
.... Curves
.... Blueprint frames
.... Pencils
.... Erasers
.... India ink
.... Pencils
.... Paper

Other Items

Texts and reference books.....

PROGRESS RECORD CHART

STANLEY TOLOCZKO

Machine-Shop Instructor
Durfee Technical High School
Fall River, Mass.

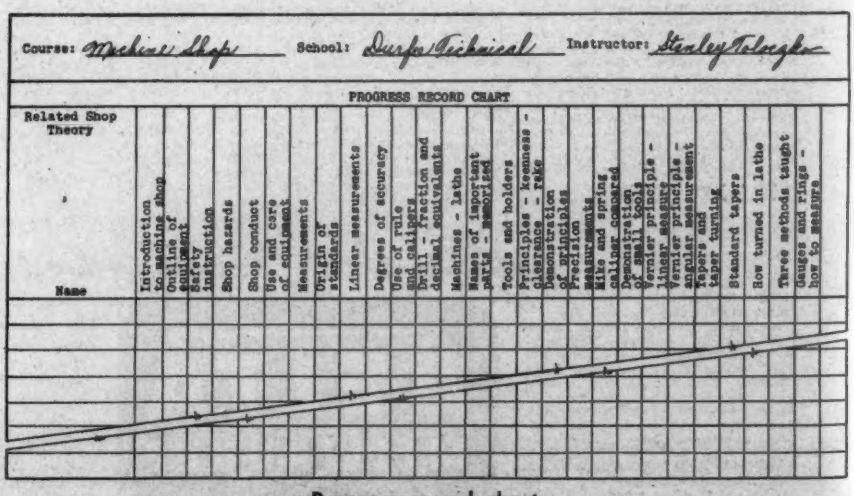
The progress record chart shown herewith was made to help the instructor in recording the work done by students in the related materials classes for machine-shop practice. The chart was designed for a 12-week national war-production refresher course. One hour each day is devoted to these related subjects. Only one of these charts is shown.

Charts 2, 3, 4, 5, 6, and 7 have the following titles.

Chart 2

Chucks and chucking
Compare to bench vise
Three and 4 jaw chucks
Independent and universal chucks

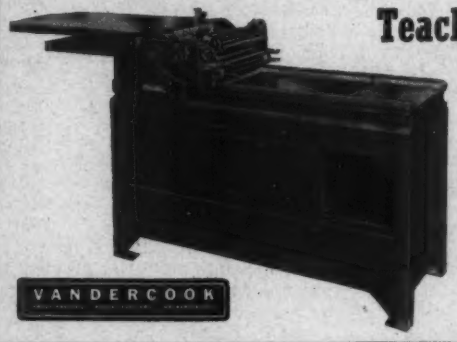
(Continued on page 20A)



Progress record chart

SCHOOL PRINTING PLANTS by ATF

For the complete school printshop—from the small general printing unit to the large vocational trade training unit—ATF has everything you need to equip your plant with modern, safe equipment. ATF Education Engineering Service is available to help you lay out a new plant, or revise your present setup to provide more modern facilities. There is no charge for this service. Consult your ATF sales representative, or write to the American Type Founders Education Department.



Teach with Equipment Great Plants Use

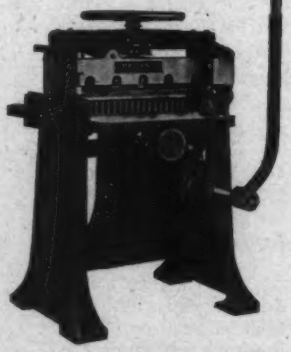
The No. 3 Vandercook Proof Press is a recognized favorite with leading printers everywhere. It is also ideal for teaching cylinder makeready, color register and how to get proper ink distribution.

In addition, the No. 3 Vandercook is a practical machine for printing programs, display cards and other school jobs. Ask your ATF representative, or write for details.

"The Best Type in Any Case!" ATF TYPE

For years, instructors have found ATF types best for the school printshop. Authentic designs of hard foundry-type metal, consistently and accurately cast, give the students a product that stimulates their pride. The types set easier, print better for a longer length of time, and distribute easier; the jobs look better set in ATF types and encourage the students. The ATF Spartans, Stymies, Lydians, Garamonds, Bodonis, Caslons, Centurys and Copperplates are on many an order these days. How about yours?

Specimen sheets of ATF types are available for class use.



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A strong well-built cutter that is highly recommended for the school printshop. Operates easily, smoothly, cuts accurately. Made in two sizes: 26½ inch and 30½ inch.

Equipped with safety lock that prevents accidental descent of knife. All-steel lever is scientifically curved to provide maximum leverage. Structural features include solid center support, overhanging arch; easily squared back gauge; duplex steel measuring tape, graduated in both 1/12 and 1/16 inches; and six-spoke clamp wheel.

A *Challenge* PRODUCT

Hamilton Equipment for Schools

No. 19191 School Type Cabinet

No. 9188-A School Press and Materials Cabinet

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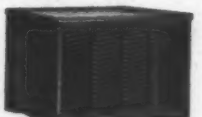

No. 13983 Imposing Table 51439

The full line includes several styles of type cabinets and imposing tables designed for vocational instruction needs ... and many auxiliary cabinets for binding work and other purposes.

MADE BY *Hamilton*

American Type Founders Education Department

200 Elmora Avenue Elizabeth, New Jersey

(Continued from page 18A)

Care in removing from lathe spindle
Purpose of rings on chuck face
How to true work
Spotting, drilling, and boring methods
Spotting and boring tools — machine receivers
Drills, drill chuck, and sockets
Methods of holding reamers
Other manipulative drills
Feeds and speeds
Lathe, drill, and milling machine
Simple formula
Time formula
Feed rather speed — production
Introduction of spur gear
History of gears
Names of parts
Gear systems — involute — circular
Gear parts defined
Tooth parts defined
Threads and threading
Formulas for threaded work
Acme, square, and worm threads
Tool clearance and depth of cut
Internal threads

Chart 3

Internal threads
Finding allowance for standard thread
Formulas and problems
Boring in chuck
Boring to size
Use compound rest for tapers
Use of taper attachment
Turning long slender shafts
Use of steady rest
Threading long slender shafts
Use of follower rest
Screw threads
Gearing for simple threads
Factoring compound gearing
Gearing fractional threads
The shaper
Names and uses of parts
Finishing planes
Shaper and lathe tools compared
Setting stroke of shaper
Holding work in vise
Swivel head for angular work
Splining tools
Cutting keyways
Benchwork
Prepare surface for layout work
Use of scribed and center punch
Use of scraping tools

Chart 4

The grinding machines
Wheels for various materials
Types of abrasives and bonds
Work speed changed to vary wheel action
The magnetic chuck
Choosing wheel for surface grinding
Demagnetizing tools after grinding
The milling machine
Names and uses of parts
Types of cutters used
Methods used to hold work
Vise — plain — special jaws
Chuck on dividing head
Milling fixtures
Clamps on table
Held on centers
The dividing head
The index plate
Spacing no less than 40
Spacing no more than 40 not prime
Spacing angles
Angular indexing
Application of fraction for desired division
The radial drill
Drilling — jig and fixture work
Use of angle plates
Sm. machine taps and dies
Use and care of sm. machine taps and dies

Chart 5

Simple mathematics
Common fractions — placing decimal point
Addition and subtraction
Multiplication and division
Practical application
Reading scale
Linear measurement
Decimal fractions
Addition and subtraction
Multiplication and division
Practical application
Decimal equivalents
Decimal equivalent charts
Reamer drill size
Reading micrometer
Reading vernier
Circular measurement
Radius problems
Diameter problems
Circumference problems
Depth of cut problems
Angular measurement
Units — degrees and minutes
Right-angle problems

(Continued on page 23A)

"REMEMBER ME?"

"Sure, you remember! I'm the kid that used to work down at the corner garage . . . they used to call me 'Grease Monkey.' Well, I'm still at it, see, only this time for Uncle Sam. Now, instead of sedans and jalopies, I work on jeeps, and peeps, and half-tracks and prime-movers. A little different, sure, but one thing's the same . . . I'm still usin' K-D Valve Tools. An' boy, out here where speed counts, *that's somethin'*. Gotta gettem rollin', but fast. Keep on buyin' War Bonds and Stamps . . . we'll do *our* job out here.

K-D Tools have gone to war. We're proud of that. But we have a job to do here at home, too. We are supplying Jobbers just as fast as we can *to fill the needs for repairing and servicing essential civilian cars and trucks. K-D Mfg. Co., Lancaster, Pa. and Hamilton, Ontario.*

K-D TOOLS
The Hustlers for Your Toolbox!

The Goblin that works for America

THE INQUISITIVE alchemists of the Middle Ages were looking for silver. Repeatedly, they smelted certain ores and got a silvery-looking metal. But it was only *silvery-looking*. It never turned out to be silver. So the alchemists thought that a malicious spirit was thwarting them, and they called the strange metal Kobold, meaning goblin.

Today that same goblin, known in America as cobalt, has become one of this country's great fighting elements. Cobalt is alloyed with chromium and tungsten to make "Haynes Stellite" alloys which have the property of "red hardness." Metal-cutting tools made of these alloys keep on cutting even when red hot! Cobalt improves red hardness and toughness in other kinds of metal-cutting tools. Thus, cobalt has contributed greatly to the tremendous output of planes, tanks, guns, and other war materials.

Cobalt is also used to produce improved magnet steels. Permanent magnets of cobalt-tungsten steel are more powerful, and last longer. Permanent magnets are necessary in much electrical equipment.

This country's cobalt formerly came from Belgium, where it was refined from African ores found in the Belgian Congo.

As war clouds loomed, and as accelerated American industry made rapid inroads on the stockpiles shipped out of Belgium during 1938 and 1939, ELECTRO METALLURGICAL COMPANY, a unit of UCC, designed and built facilities in this country for the Belgians. ELECTROMET now operates these facilities so that HAYNES STELLITE COMPANY, another Unit of UCC, and other American companies can have the cobalt they need for essential war work. Operations began in 1941. Today, these facilities annually produce more cobalt than was ever imported in any year previously.

BUY UNITED STATES WAR BONDS AND STAMPS

RED HOT... STILL CUTTING! Faster production of metal equipment of all kinds is made possible by high-speed metal-cutting tools containing cobalt.

SIGHTED SUB! Better radio transmitting tubes and improved electrical equipment are assured by cobalt.

CALLING HEADQUARTERS! Telephones and other electrical equipment require permanent magnets. The better magnet alloys contain cobalt.

WEAR-FIGHTER! Planes fly farther with fewer repairs, thanks to exhaust valves protected with "Haynes Stellite" cobalt-chromium-tungsten alloys.

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FOR INSTRUCTION, TOO... *Industry's Test Instruments*
COST LESS . . . BECAUSE OF THEIR LONG-LIFE DEPENDABILITY!

RELAYS
Sensitive and Power Uses
Current and Voltage Types

SERVICE EQUIPMENT
Tubecheckers, Analyzers, Oscillators, Ohmmeters, Vacuum Tube Voltmeters

LIGHT MEASURING DEVICES
Illumination Meter, Foot Candle Meters, Sight Meter, Exposure Meters

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Power Analyzer, Photoelectric Potentiometer, Battery Testing Instruments

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Ammeters, Voltmeters, Wattmeters, Galvanometers, Microammeters, Ohmmeters, Microfarad Meters

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Portable and Switchboard — Potential and Current

PORTABLE INDICATING INSTRUMENTS
Ammeters, Voltmeters, Wattmeters, Galvanometers, Microammeters, Ohmmeters, Microfarad Meters

LABORATORY STANDARDS
Voltmeters, Ammeters, Wattmeters

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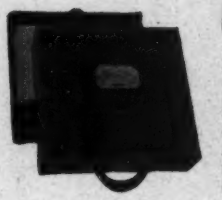
Ideally suited for classroom instruction and student use because of their dependability, ruggedness and relatively low cost . . . features which have made the Model 430 line so universally preferred throughout industry. Have hand-calibrated mirror scales of long length, with large scale openings. Accuracy within ½ of 1%. Sturdy Bakelite cases give added protection in service. Extremely compact. Available in complete line of A-C and D-C instruments.

WESTON *MODEL 785*



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Without Dies

DI-ACRO Precision Machines—Shears, Brakes, Benders—have made possible a method of "DIE-LESS DUPLICATING" that practically amounts to a new production technique for making a great variety of small parts and pieces. Leading schools and universities are equipped with these bench machines, and thousands are in use by War industries, saving Man Hours and Critical Materials. Their ease of operation makes them ideal for use by girls. Investigate their possibilities for your training courses.

In illustration from left to right: 1st—Di-Acro Shear squares and sizes material, cuts strips, makes splits or notches. 2nd—Di-Acro Brake forms angles, channels or "Vees." 3rd—Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. All duplicated work is accurate to .001".

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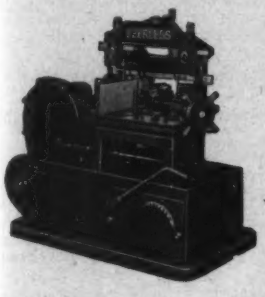
77 McDowell St. Columbus, Ohio

Rubyfluid

PEAK PRODUCTION BEGINS AT THE TRAINING BENCH WITH PEERLESS METAL CUTTING POWER SAWS



Industry's peak wartime demand for trained men and women—people who can step into a fast-moving production line without slowing down the pace—is for industrial arts directors both a responsibility and an opportunity.

The responsibility to furnish men ready for the job—the opportunity to further add to your reputation for turning out fully trained men—is best fulfilled by training on the machines the most progressive industries use today.

In the vital field of metal cutting—the exact sawing of parts required for finished products—Peerless Metal Cutting Saws get the call from industry because of their faster action—safety features, accurate cutting and operating economy.

On Peerless you can teach the operation of a fully automatic metal-cutting Saw with exclusive, hydraulically controlled micrometer length gauging—only Peerless has the patented *Four-Sided Saw-Frame and Backing-Plate Blade-Support.*

There are four bulletins covering the broad Peerless Line—Bulletin 50-A on High Duty Hydraulic types . . . Bulletin 53 on Heavy Duty Hydraulic Saws for die-block work . . . Bulletin 51-A for Universal types with mechanical control . . . and Bulletin 52 covers Standard Models for general utility cutting.

PEERLESS MACHINE COMPANY, Racine, Wis.

Peerless
THE ONLY METAL CUTTING SAW
WITH FOUR-SIDED SAW-FRAME AND BACKING-PLATE

Fast ACCURATE Sawing DEMANDS PEERLESS BLADE CONTROL

(Continued from page 20A)

60-deg. problems
Formulas
Threading problems
Cutting speeds and feeds
Taper turning
Tap drills
Square, hexagon, and octagon

Chart 6

Introduction
Purpose of blueprint
Making of blueprints
Kinds of drawings
Perspective
Isometric
Cabinet
Oblique
Orthographic
Two views — square block
Three views — rectangle
Three views — "L" block
Kinds of lines
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Hidden
Center
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Dimension
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Personal News

♦ Dr. William T. Bawden, head of the department of industrial education, Kansas State Teachers College, Pittsburg, Kans., has been appointed by Gov. Andrew Schoeppel, Topeka, Kans., as a member of the Governor's Commission on Education and Civilian War.

Dr. Bawden also is the chairman of the College Committee on the war effort.

♦ Wayne P. Hughes, Assistant Professor of industrial-arts education at Eastern Illinois State Teachers College, Charleston, Ill., has been granted a leave of absence to accept a special assignment in the field of vocational safety. He joined the staff of the Education Division, National Safety Council, as a consultant in industrial vocational safety.

♦ Paul A. Lerner, supervisor of industrial-arts education and director of the War Production Workers Training School at Troy, Ohio, has been granted a leave of absence from his position to accept a commission as Lieutenant (jg) in the Air Corps of the United States Naval Reserve.

Lieutenant Lerner was an industrial-arts instructor at Cambridge, Ohio, for 12 years before coming to Troy in July of 1941. He was instrumental in the development of the new arts and industries laboratory at Cambridge, Ohio.

Lieutenant Lerner organized and directed the activities of the War Production Workers Training School in Troy. This school used the facilities of the high school laboratories and the Hobart Trade School of Welding. The War Production Workers Training School has had a staff of 16 instructors and to date has trained some twelve hundred warworkers.

♦ Clarence T. Baab, assistant professor of industrial arts, Colorado State College of Education, Greeley, has passed his qualifying examinations for the doctor's degree at the Pennsylvania State College.

♦ Professor George F. Henry of the Colorado State College, Fort Collins, is pursuing doctoral work at the Pennsylvania State College.

♦ H. W. Deane has been appointed instructor-co-ordinator of the newly organized cooperative part-time retail program at Hutchinson, Kans. Previous to his present position, Mr. Deane was employed by the International Harvester Company. He has a fine background of teaching, school administration, and retail experience.

♦ E. L. Fink, Topeka, Kans., has been appointed night school director for the period of absence of Perdue B. Graves. Mr. Fink has been instructor of typing and bookkeeping in the Topeka High School for the past ten years and has been an instructor in the night school.

♦ Robert T. Stoner is superintendent of the Pennsylvania State School of Aeronautics at Harrisburg. An extensive training program is carried on at this school.

♦ The following, all former students of The Stout Institute, Menomonie, Wis., have entered the U. S. Armed Forces: Don P. Elliot, Gerhard Nelson, William Trudgeon, LaVerne Schneck, Don McKibben, Don Berg, Tony De Chiara, Grant Bakken, and Paul Schwartz.

♦ D. Russell Winegarden, teacher of industrial arts, was appointed supervisor of elementary crafts for the city schools, Indianapolis, Ind. It will be his duty to develop a program of industrial-arts work for the lower grades.

♦ Perdue B. Graves, local evening school director at Topeka, Kans., has joined the army.

(Continued on page 27A)

Shop Equipment News

New Products — Publications

UNIVERSAL TURRET LATHE SCREW MACHINE

Production attachments are now available to convert the Atlas F series 10-in. lathe into an efficient hand-type screw machine for the rapid production of small precision parts. The addition of independent or universal chucks adapts this equipment to turret lathe work.

This most recent Atlas lathe production setup includes: lever-type collet chuck, carriage turret with four-way tool post and back-slide tool post, tailstock turret for six operations, multistop attachment for gauging length of cut, reversing switch, and spindle nose cap. The lathe is equipped with reversible power cross feed and longitudinal feed, complete V-belt drive, and tapered roller spindle bearings.

The collet capacity is ½ in.; swing over bed 10¼ in.; 16 spindle speeds between 28 and 2072 r.p.m.; and the thread-cutting range, right and left, is 4 to 96 (standard). There are four bed lengths available, capacity 18 to 36 in. between centers; carriage turret posts take ⅜-in. cutter bits; and the tailstock turret head has six ¾-in. bored holes for toolholders.

For complete details write Atlas Press Company, Dept. 7, Kalamazoo, Mich.

For brief reference use IAVE—410.

THANKS TO YOU
STARRETT TOOLS ARE IN GOOD HANDS

No one is more keenly appreciative of the contribution you have made and are making to our Country's vast precision production program than the makers of Starrett Precision Tools.

Without the knowledge and appreciation of truly fine tools that you have instilled, production would fall far short of the goals that have been set and met.

Our hats are off to the teachers of precision workmanship. We can best express our appreciation by promising you that Starrett Tools will always be worthy of those hands that develop their skill under your guidance.

THE L. S. STARRETT CO., ATHOL, MASSACHUSETTS, U. S. A.
World's Greatest Toolmakers

STARRETT TOOLS
Precision Tools... Dial Indicators... Ground Flat Stock... Hacksaws... Metal Cutting Band Saws... Steel Tapes

A BOOKLET OF SCRIPT ALPHABETS

The Higgins Ink Co., 271 Ninth St., Brooklyn, N. Y., have just issued a new 36-page booklet entitled "Script and Manuscript," in which are presented 32 modern script alphabets.

With each alphabet there is a short descriptive paragraph, indicating where the alphabet may be used more appropriately.

The booklet also contains several examples of engrossing.

A price of 50 cents has been placed upon this booklet.

For brief reference use IAVE—411.

THE INSTALLATION AND LEVELING OF THE LATHE

Anybody interested in more efficient war production will find helpful information in the third of a new series of bulletins that has just been issued by the South Bend Lathe Works, South Bend, Ind.

Bulletin H-3, entitled "The Installation and Leveling of the Lathe," covers the many points which must be taken into consideration when installing lathes so that the most efficient operation can be obtained. Among the subjects described and illustrated are unpacking the lathe, illuminating, floor layout, supporting and securing. The procedures for horizontal and transverse leveling, both as installation and maintenance operations, are given in detail.

This firm has also just issued bulletin 1002 describing the South Bend Turret Lathes, Nos. 1001–Z and 1002–Z. This bulletin is free to machine-shop instructors.

Convenient tabulated specifications list all the necessary information concerning capacities, feeds, speeds, and dimensions.

These turret lathes are designed for the rapid production of small chucking and bar work to close tolerances. Both models have a 10⅛-in. swing over the bed and saddle wings, 1⅜-in. hole through the headstock spindle, and 1-in. collet capacity.

For brief reference use IAVE—412.

DITTO OFFERINGS

Announcement is made that while present stock of Ditto, Rotary Model R5 and Portable Model H3, is available, the equipment may be had without priority.

Attractive booklets, "More Leisure Time," "Ditto Portable Duplicator," "R5 Gelatin Duplicator," and "Ditto Direct Process Duplicators" are available for distribution.

For further information address Ditto, Inc., Harrison at Oakley Blvd., Chicago, Ill.

For brief reference use IAVE—413.

CHIP BREAKER CHART

McKenna Metals Co., 305 Lloyd Ave., Latrobe, Pa., is announcing that "Chip Breaker Charts" are available upon request to metal machining plants using carbide tools.

These wall charts, printed in three colors, present dimensional diagrams for the correct grinding of parallel, angular, and groove type chip breakers. The charts show photographs of the three chip breaker types and the kind of chips which will result from the use of each type of breaker.

In addition to precautionary instructions on chip breaker grinding, the charts give chip breaker dimensions for all three types in relation to depth of cut and feed of the operation to be made.

For brief reference use IAVE—414.

THE SHIP ELECTIONS

At a recent meeting of The Ship, CHARLES A. ROPER, publications manager of McKnight and McKnight, Bloomington, Ill., was elected captain; WALTER KANE, Milton Bradley Co., Beverly Hills, Calif., first mate; A. L. OPIE, The O. P. Craft Co., Inc., Sandusky, Ohio, second mate; FRED BAHRENBURG, Strathmore Paper Co., Springfield,

(Continued on page 31A.)

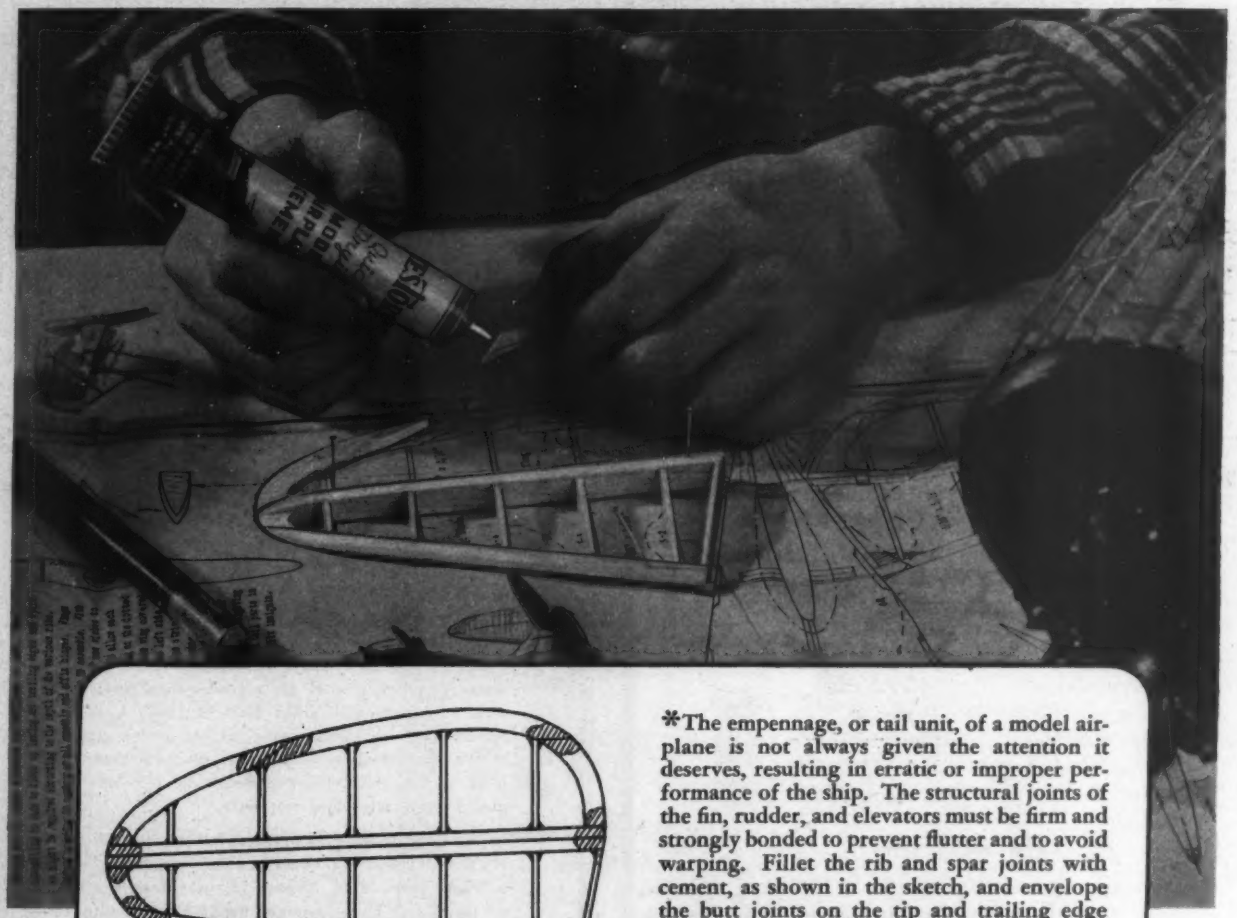
TESTORS

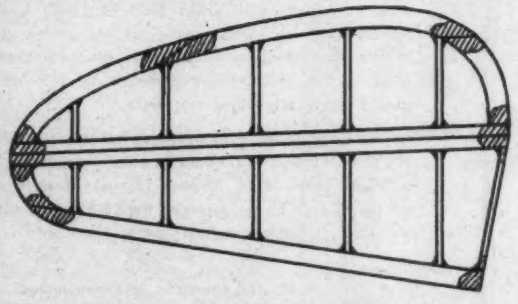
CEMENT AND DOPE FOR MODEL AERONAUTICS

FIRST CHOICE OF AMERICA'S MODEL BUILDERS

No. 4 in a Series on Principles of Better Craftsmanship

*HOW TO MAKE STRONG TAIL ASSEMBLIES





*The empennage, or tail unit, of a model airplane is not always given the attention it deserves, resulting in erratic or improper performance of the ship. The structural joints of the fin, rudder, and elevators must be firm and strongly bonded to prevent flutter and to avoid warping. Fillet the rib and spar joints with cement, as shown in the sketch, and envelope the butt joints on the tip and trailing edge formers. Use Testor's Model Airplane Cement for strongest, toughest joints.

You will find these practical data sheets a helpful guide for your classes. May we suggest that you save and file the entire series.

Now! Get complete details about Testor's Model Airplane Cements and Dopes

TESTOR CHEMICAL CO., ROCKFORD, ILLINOIS, U.S.A.

Minnesota
SUMMER SESSION
Department of Industrial Education
COLLEGE of EDUCATION

★

Separate Enrollment for Either or Both Terms
June 15 - July 24 or July 26 - August 28
SOME THREE-WEEK COURSES

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Four-year Curriculum—B.S. Degree
Master's Degree — Plans A-B-X-Y
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Industrial Arts and
Smith-Hughes, George-Deen Courses
Excellent Library Facilities
Unexcelled Recreational Program
Wide Range of Manipulative Courses

★

Correspondence concerning credit transfer, graduate status, and advanced programs, should be addressed to the Department of Industrial Education, 200 Eddy Hall. Four-year curriculum and advanced patterns upon request. (Revised)

Bulletins of the Summer Session may be obtained by writing to the Director of Summer Sessions,
1009 Administration Building

UNIVERSITY OF MINNESOTA
Minneapolis, Minnesota

The Pennsylvania State College
Summer Sessions - 1943

Inter-Session
June 7 to June 25

Main Summer Session
June 28 to August 6

Post-Session
August 9 to August 27

The Summer Semester
June 7 to September 24

Trade and Industrial and Industrial Arts Education

Doctors', Masters', and Baccalaureate degrees

Three summer sessions for in-service teachers, administrators, and other qualified individuals. Short, unit courses designed to meet current national problems.

for further information and catalogue address:

Director of Summer Sessions
Room 104 Burrowes Building

THE PENNSYLVANIA STATE COLLEGE
State College Pennsylvania

THE STOUT INSTITUTE

MENOMONIE WISCONSIN

1943 Summer Session June 21—August 20

Three — Six — Nine Weeks Courses

GRADUATE AND UNDERGRADUATE

Courses adapted to the problems and requirements of the times:

Industrial Arts	Home Economics Education
Trade & Industrial Education	Dietetics
Radio & Aeronautics	General Home Economics
"Educational Workshops"	Related Art
Liberal Arts	Consumer Education

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College work immediately available for high school graduates. Special conferences conducted by state and national leaders. Timely demonstrations in use of teaching facilities and materials. Modern laboratories, planning rooms, and demonstration shops available.

Summer Session Bulletin Sent on Request
Director of Summer Session

THE STOUT INSTITUTE, Menomonie, Wisconsin

CASH SCHOLARSHIPS
of $180 to $500

EARN in Essential War Industries in Detroit
WHILE YOU LEARN at Wayne University

Detroit's great arsenals of democracy are providing essential summer work for teachers who qualify with cash scholarships of from $180 to $500. A splendid opportunity to further your education by attending Wayne University — enrich your teaching background with actual industrial experience in Detroit's great plants — to earn while you learn.

Teachers under this program attend classes out of shift. Graduate and under-graduate programs — main session, June 21 to August 13, post session, August 16 to August 27 — approved Smith-Hughes courses — aviation workshop center.

Write for Circular of Information

WAYNE UNIVERSITY
INDUSTRIAL EDUCATION DEPARTMENT
467 West Hancock Detroit, Michigan

(Continued from page 23A)

♦ ROBERT BRIERLY, who graduated from The Stout Institute in 1934, has accepted a position as engineer with the Glenn L. Martin Co., Omaha, Neb.

♦ LEO GARDINER, who graduated from The Stout Institute in 1934, was commissioned Lieutenant for the U. S. Navy.

Association News

♦ The Pennsylvania Vocational Association recently placed a copy of "Learning to Earn," an illustrated bulletin made available through the P.V.A., on the desk of each legislator, in order to let them know what is being done in the state in the field of vocational education. — *F. Theodore Struck.*

♦ The American Society of Tool Engineers will hold its annual convention at the Milwaukee Auditorium, Milwaukee, Wis., on March 25, 26, and 27.

♦ The Illinois Vocational Association will hold its annual convention at Peoria, Ill., on April 2 and 3. Hotel Pere Marquette will be the headquarters.

♦ The American Industrial Arts Association, along with the American Association of School Administrators canceled its St. Louis convention at the instance of the Office of Defense Transportation. An executive session of officers, national and affiliate, will now be held in New York City at the Hotel McAlpin on Saturday, April 10. Persons interested in associational work and the progress of industrial-arts education are welcome. The daylong conference will be devoted principally to business matters and to planning.

♦ The department of industrial education of Kansas State Teachers College, Pittsburg, Kans., held its eighth annual dinner in the Arabian Room, Hotel Besse, on Saturday evening, January 16, 1943, at six o'clock. Dr. William T. Bawden, head of the department, and Mrs. Bawden had as their guests the members of the department faculty and their wives; President and Mrs. Rees H. Hughes; Dean and Mrs. O. P. Dellinger; and members of the senior class.

The dinner is held each year to provide opportunity to hear reports from members of the department faculty who attend the important industrial education conventions of the year, and other speakers.

On the program following the dinner, Dr. Otto A. Hankammer spoke on "Technical Training for Enlisted Men," and reported on the courses he has been offering at the College as a part of the Civilian Pilot Training program; also on the training program of the Glider Pilot School of the U. S. Army Air Corps.

Professor Earnest W. Baxter, who is absent on leave this year, employed in the plant training department of the Pratt and Whitney Corporation, Kansas City, Mo., spoke on "Training Workers for War Industry."

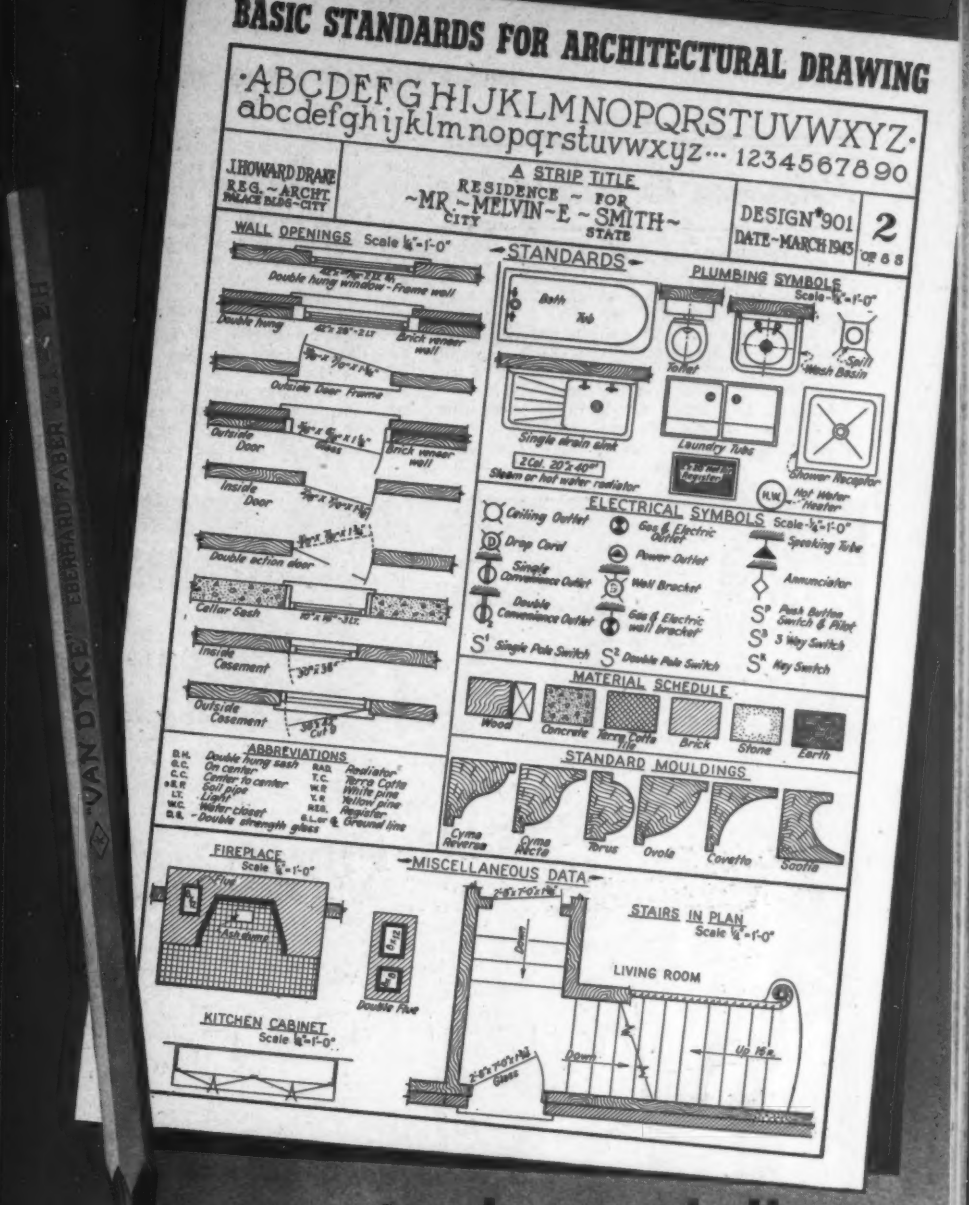
Professor Walter L. Friley, who for the past two years has been supervisor of student employment for the College, reported on "Problems of Student Employment."

Professor Rudolph L. Schwanzle, who is absent on leave as regional supervisor of training centers for the National Youth Administration, with offices in Denver, Colo., spoke on "Suggestions for Industrial Arts."

Dr. Bawden served as toastmaster, and gave a report on the thirty-sixth annual convention of the American Vocational Association, which he attended in Toledo, Ohio, December 3 to 5, 1942.

"Production of war goods would never have approximated the goals set by the President had not the vocational schools of the nation developed adequate training programs."

— *Brigadier General Frank J. McSherry.*



Highest Skill...

The student's highest skill develops most rapidly when fundamental training is reinforced by his use of the right tools. There is an important relationship, then, between inspired instruction and the pencils he becomes acquainted with... He who early gains acquaintance with MICROTOMIC "VAN DYKE" Drawing Pencils is equipped from the start to best exploit his latent talents. He knows it is his production at the board which shows forth.

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To those teaching the basic elements of architectural drawing, Eberhard Faber will send a wall size (16½" x 27½") reference chart FREE. Write for yours today.

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EBERHARD FABER PENCIL CO., Educational Dept., 37 Greenpoint Ave., Brooklyn, N.Y.
Send me, without cost, your No. 2 Wall Chart on Standard Practice in Architectural Drawing and your new descriptive folder. ☐ Include chart "Standards in Mechanical Drafting."

Name _____ School _____

Address _____

Answers to Questions

FINISHING PHILIPPINE TANGUILE

1095. Q.: I am building a kneehole desk of Philippine tanguile, and I should like to have your help in finishing it.

I want very much to stain it the rich, soft, medium, or dark red mahogany which is found on high grade furniture, and I should like to get a durable satin finish over the stain. — *J. P.*

A.: For the finish use DuPont penetrating wood finish. It will give you exactly what you desire, and it is easy to apply. Since tanguile is an open-pored wood, especial attention must be given to follow the directions on the can for the use of the filler coat. This should be made on a silex base, colored with pigment colors only, mixed as directed with some of the penetrating wood finish and then applied over the well-dried stain coat. Since tanguile is notorious for its grain-raising proclivities I am suggesting that the finished cabinet wood be sponged with a hot water solution of one cup of hot cabinetmaker's glue per 12-quart pail of hot water. Let dry overnight, sand with 6/0 garnet finishing paper to a true and smooth surface, stain, dry overnight, and then fill as directed. Let this filler coat dry not less than 48 hours due to the extreme depth of the pores in the mahogany. Then proceed with the wood finish schedule, but use a three-coat application rather than a one or two. For the last coat, load a flat pad of 3/0 steel wool with floor wax and then rub the entire job in straight lines wherever possible. Buff, rag, or brush to the desired sheen.

The book entitled *Wood Finishing and Painting Made Easy*, published by The Bruce Publishing Co., Milwaukee, Wis., may prove to be of considerable help in doing work of this kind. — *Ralph Waring.*

FINISHING A CHINESE PIPE

1096. Q.: I have a problem on which I would appreciate a little information. An old Chinese smoking pipe, about 30 in. long, with a diameter of ¾ in. at one end and 1 in. at the other, and a hole of approximately ⅛ in., running through the center, and a 3-in. ivory stem on the mouth end and a small brass pipe on the other, has developed checking and cracking on the wooden part. What would be the best method of repairing this, and because of the value of the pipe, what should be done to stop further checking and cracking? — *H. L. M.*

A.: Wash the entire job with a weak solution of trisodium phosphate (Oakite or Tromete), using about one rounding tablespoonful per quart of warm water and scrub with a hand brush. Hang up and let dry. Use about an ounce of natural silex base filler (uncolored) and a half cupful of DuPont Penetrating Wood Finish, stirring well together. This DuPont finish is made of the same China wood oil (Tung) as was used originally on the pipe when new. Apply as a filler to the entire wood portion and force it into all checks and cracks until packed hard and leveled. Wipe off clean and bright. Let dry overnight. Brush or rag on a coat of DuPont finish as it comes from the can, being careful to stir well first. Let set half an hour and wipe off with rags, or polish off with a pad of 2/0 steel wool. Let dry overnight, then rub with the same steel wool loaded with floor wax, to a very smooth and clean surface, dry, and then buff with rags or brush as desired.

Save the can of filler mixture against the time when another check or two may develop. The above treatment should prove effective for all time, however. — *Ralph G. Waring.*

Filing Hints to meet war-time needs

HELLER NUCUT

SPECIAL PURPOSE FILES

In addition to such broad classifications as machinists' files and saw files, there are Special Purpose Files. These are specially designed for a particular kind of work such as lathe filing. Or for a particular material such as aluminum, stainless steel or plastics. The table gives a quick picture of the more commonly used Special Purpose Files.

NAME	SHAPE	CROSS SECTION	DESCRIPTION	GENERAL USES
Aluminum	Flat Half Round		Free, easy-cutting file for rapid cutting.	Aluminum and its alloys. Other soft metals.
Brass	Flat Half Round		Fast-cutting file. Sharp teeth, with open cut, do not fill up with chips, or scratch the work. Double cut only.	Soft metals such as bronze, brass, copper, and aluminum.
Foundry	Flat Half Round		Short, stubby, sturdy teeth. Good for snagging operations.	Rough filing, castings, hard metals generally.
Long Angle Lathe	Flat		Single cut, both edges safe or uncut. Long angle (counter-clockwise from center line to rows of teeth) and tooth shape make possible smooth clean cut.	Lathe work where smooth finish is desired. Also soft metals such as bronze, brass, aluminum.
Lead Float	Flat Half Round		Coarse single cut file, commonly known as a "float"	Brass, aluminum, lead, babbitt and other soft metals.

"MORE CUTS WITH NUCUTS" means just what it says—you can file *more, faster, better, with less effort* with a NUCUT File.

HELLER BROTHERS COMPANY • Newark, N.J. • Newcomerstown, Ohio

America's Oldest File Manufacturers—Good Tools Since 1836

HELLER NUCUT WAVY TEETH FILES

PATENT No. 2027039

The women in American industry now have an emblem, too. Christened last week by Harry Woodhead, president, Consolidated Aircraft Corporation, as the WICS — for Women's Industrial Corps — he called on all industry engaged in war production to give women workers the recognition accorded the WAACS, WAVES, and SPARS. "Women fighting the hard battle of producing needed materials are as vital to our ultimate victory as any other woman who leaves her home responsibilities to replace men in war service."

★

A frank statement on the LUMBER situation

★

TODAY Americans are managing to get along without of a lot of things usually thought necessary. That is going to help win the War — *quicker — and at less cost.*

★ ★

Such is real American Patriotism.

★ ★

Because our Nation's productive drive is a typical high-speed American effort, it gets first call on all available materials, and the Government asks all who can do so to use non-essential materials.

★ ★

That is the situation in the Lumber Industry, and it applies specifically to Yellow Poplar, Mahogany and Plywood.

★ ★

Lumber is used extensively and is of importance in school project work — BUT because of increasing Military and Naval demands put upon stocks, it is a physical impossibility to allocate to the Schools enough to go around. So we feel sure that, having a clear understanding of the situation, you will be willing to cooperate by using non-essential wood or woods not so highly critical.

★ ★

For instance, instead of Yellow Poplar, Mahogany or Plywood, perhaps you can use other woods such as White Pine (although that too is in heavy demand) Chestnut, Red Oak, Basswood, Cedar, Maple, Ash, Cherry, Red Gum or Cypress, and thus cooperate with the War Effort, and aid in bringing about a quicker Victory.

★ ★

It will help to maintain the best possible service to Schools if you will issue smaller and more frequent orders, instead of asking for a whole year's supply at once. Better service can thereby be made possible to all.

★ ★

Deeply appreciating the business that Schools from Coast to Coast are so generously giving us, we pledge ourselves to endeavor to take the best possible care of present and future needs. In this we ask your indulgence and your cooperation.

DRASTIC RESTRICTIONS

have been placed by the War Production Board on the following Lumber:

YELLOW POPLAR
(General Conservation Order M-279)

MAHOGANY
(General Conservation Order M-122)

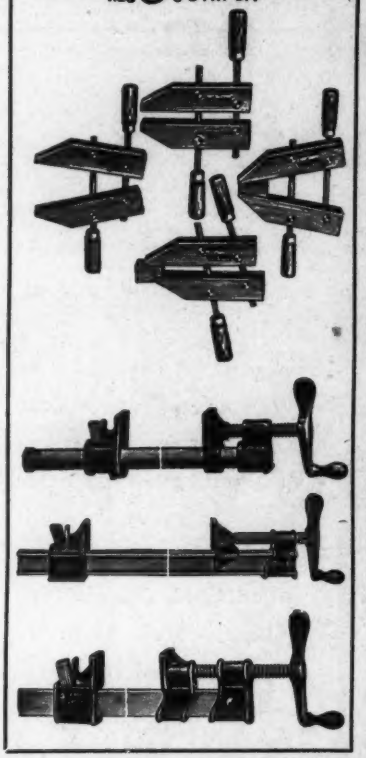
PLYWOOD
(LIMITATION ORDER L-150 requiring a priority of AA-5 or better)

Because of requirements for Defense of the United States a serious shortage has developed in the above-mentioned woods for civilian use and for export, necessitating restrictive orders in the public interest and to promote National Defense. Complete copies of the above orders may be obtained from your local WPB office.

BRODHEAD-GARRETT CO., CLEVELAND

"Supplying Defense Training Needs to Schools in All 48 States"

"Jorgensen" TRADE MARK REG U S PAT OFF



stands for highest quality

CLAMPS

It is not enough merely to specify "JORGENSEN" when ordering. You should look for the "JORGENSEN" Trade-mark on the handscrews which you receive to avoid future disappointment. Genuine "JORGENSEN" handscrews have clear, strong, well-seasoned jawa, with handles that do not loosen, with long-wearing threads, and nuts that do not break. They will stand "schoolboy" service. Look for the "JORGENSEN" trade-mark.

Genuine "PONY" Clamps are designed, manufactured and guaranteed by us also. Style No. 50 "PONY" Clamp Fixtures are recommended for schools because they attach to ordinary ¾" pipe to make clamps of any desired length, providing low-cost, light, strong clamps for work of any size. Equipped with the finest and exclusive "Multiple Disc Clutch" holding device, which "zips" to position and stays put any place.

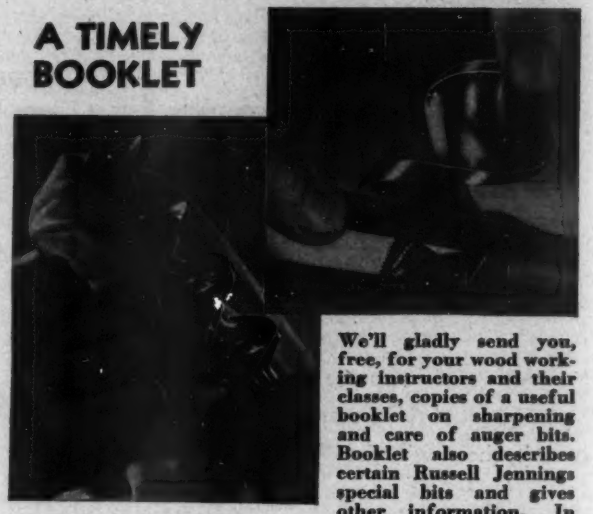
Write for No. 16 General Clamp Catalog

ADJUSTABLE CLAMP CO.

"The Clamp Folks"

424 N. Ashland Ave., CHICAGO

A TIMELY BOOKLET



ON SHARPENING and CARE OF BITS

We'll gladly send you, free, for your wood working instructors and their classes, copies of a useful booklet on sharpening and care of auger bits. Booklet also describes certain Russell Jennings special bits and gives other information. In light of the present vital need to make tools do their best and last their longest, you will find this booklet very valuable.

Russell Jennings AUGER BITS

THE RUSSELL JENNINGS MFG. CO., CHESTER, CONN.

Practical Textbooks

Examine Them on APPROVAL

These modern texts have been especially prepared for school use. You can employ them to excellent advantage in your Victory Training program as well as your regular program. An examination will convince you of their suitability to your classroom needs. Any books sent for 30 days ON APPROVAL inspection subject to our educational discount if retained.

Dunwoody Arc Welding Unit	$1.25
Dunwoody Gas Welding Unit	1.25
Mechanical Drawing	2.00
How To Plan A House	4.50
How To Remodel A House	4.75
Fundamentals of Electricity and Workbook	2.50
Fundamentals of Machines and Workbook	2.50
Fundamental Shop Training and Workbook	2.50
Plane Trigonometry Made Plain	2.75
Shipbuilding Blueprint Reading	3.00
Machine Trades Blueprint Reading	2.00
Plastics	3.00
How To Read Electrical Blueprints	3.00
*Flight—First Principles	2.50
*Flight—Aviation Engines	3.25
*Flight—Meteorology and Aircraft Instruments	3.25
*Flight—Construction and Repair	2.50
Machine Shop Work	3.50

*Note: These books have been listed in Leaflet No. 63 issued by U. S. Office of Education

(TEAR OFF HERE AND MAIL TO US)

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FREE SAMPLE

Write on your school letterhead, and test samples will be sent at once. No obligation.

THE FRANKLIN GLUE CO., Columbus, Ohio

(Continued from page 24A)

Mass., log officer; JOHN CLAUDE, The Bruce Publishing Co., Milwaukee, Wis., purser; FRANK O. DUNNING, Floguil Products, Inc., New York City, radio officer; and BERT CHOLET, Higgins Ink Co., Inc., Brooklyn, N. Y. steward.

Charles Roper, the new captain of The Ship, became a member of The Ship at Louisville in 1926. He has been very active in Ship's affairs at the A.V.A., Eastern Arts, Western Arts, and many state meetings, and has been an officer of The Ship for several years.

MILLING AND GRINDING MACHINE CATALOG

Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio, have issued a new catalog No. M–995–1, which contains illustrations, condensed information, and specifications describing the full line of milling machines, broaches, tool grinders, grinding machines, centerless grinders, centerless lapping machine, and attachments manufactured by this firm.

For brief reference use IAVE—415.

News Notes

♦ Through an arrangement between the New York Central High School of Needle Trades, the American Red Cross, and the New York fur manufacturers, American merchant sailors carrying supplies to far northern ports, are fitted out with fur vests, caps, and mittens.

The fur manufacturers donate furs found to be commercially not acceptable, the students do the sewing, and the Red Cross in cooperation with the Maritime War Emergency Board takes care of the distribution.

♦ Eighty free loan packets on Education in Wartime are now available for loan, consisting of materials contributed through the cooperation of schools, organizations, federal agencies, and publishers. Each of the packets contains about twenty items ranging from one page to more than fifty pages, selected to offer suggestions concerning ways in which schools, colleges, and communities can aid in the war effort. The loan period is two weeks, and not more than two packets may be ordered at a time. Franked labels are furnished for the return without payment of postage of packages weighing four pounds or less.

Write to Information Exchange, U. S. Office of Education, Federal Security Agency, Washington, D. C.

♦ To meet war needs for multilith cameramen-platemakers and press operators for federal agencies, the United States Civil Service Commission has modified requirements in order to secure applicants. Women are being placed in multilith work.

Positions now pay $1,970 a year for cameraman-platemaker, and $1,752 a year for press operator—an increase over previous salaries because of compensation for overtime.

For cameraman-platemaker, 1 year of paid experience in multilith work is qualifying, provided 6 months of it was in the photographic and platemaking phases of the multilith process. This work must have included the operation of a copying camera, development of negatives, sensitizing of multilith plates, transfer of prints from negatives to plates, and preparation of plates for use in the multilith machine.

Training may qualify for press operator—80 hours of instruction, including not less than 50 hours in actual operation of a multilith press. Persons may also qualify for press operator positions by having at least 3 months of paid experience in the operation of a multilith press.

Applicants must be 16 years or older—no maximum age limit. No written test is required. Applications, available at first- and second-class post offices, the Commission's regional offices, or the Commission in Washington, D. C., should be sent to the Commission's Washington office. Warworkers now utilizing their highest skills, or prohibited from change of employment by War Manpower Commission restrictions, should not apply.

♦ The high school program at Lawrence, Kans., has been set up on a schedule which enables boys and girls to carry on a complete high school course either in forenoon or afternoon and then work the other half day. This schedule has been adopted to relieve the city and farm labor shortage at Lawrence. Approximately 250 boys and girls are working regularly at half-day jobs, while about 150 are employed whenever their services are needed. This is half of the high school enrollment.

New Publications

Machine Shop Science and Mathematics

By Joseph J. Eaton and Albert V. Free. Cloth, 187 pages, 5⅓ by 8 in., illustrated. Price, $2. Paper-bound copy available at $1.48. Published by The Manual Arts Press, Peoria, Ill.

A book presenting methods for solving problems involved in the application of weights and measures; simple machines; strength of materials; force, work, energy; heat and its effects; motion; shop chemistry; and compound machines.

Industrial Inspection and Assembly

By Edward N. Whittington. Cloth, 202 pages, 5¾ by 8⅛ in., illustrated. Price, $1.75. Published by McGraw-Hill Book Co., New York, N. Y.

(Continued on next page)

"It Takes a Tool that's Precision Built to Do Precision Work"

Just as water never rises higher than its source, so is the accuracy of your tool and die work limited by the accuracy of the tools, machines, and instruments you use. This is most important in your grinders, because grinding governs the most critical dimensions. Working to tolerances of one ten-thousandth is every-day practice with Dumore precision grinders, because these grinders are themselves built by craftsmen who work and think and talk in terms of a tenth. Equally important and equally accurate is the control of all inertia forces by dynamic balancing of supreme sensitivity — not by assemblies, but piece by piece and part by part. See for yourself the secrets of Dumore precision in the drawing below.

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9. FAN DRAWS air in through a filter, provides blast to keep both motor and quill cool.
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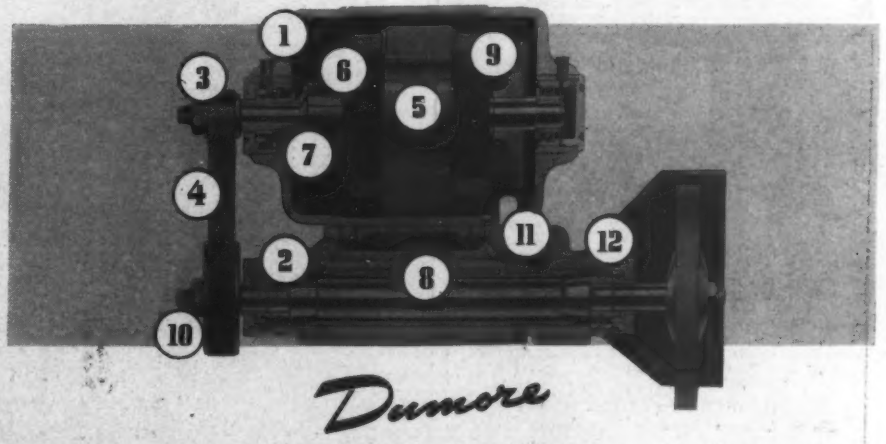

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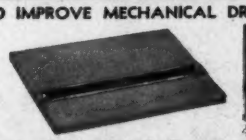

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(Continued from previous page)

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The appendix contains numerous useful tables.

Materials and Methods for Vocational Training

By Warren E. Hill and Claude H. Ewing. Cloth, 171 pages, 6¼ by 9⅛ in., illustrated. Price, $2. Published by McGraw-Hill Book Co., New York.

A book designed to help the new vocational teacher in analyzing his field, make an outline of instruction, and developing and writing his instruction sheets, operation and information sheets, assignment and reference sheets, job sheets, and his related instruction material.

Introduction to Naval Architecture

By John P. Comstock. Cloth, 209 pages, 6¼ by 9¼ in., illustrated. Price, $4. Published by Simmons-Boardman Publishing Co., New York, N. Y.

Written by an experienced man, this book, which presents the course in theoretical naval architecture taken by the hull drawing apprentices at the shipyard of the Newport News Shipbuilding and Dry Dock Co., will be of great value to the beginning student of naval architecture anywhere.

The rules and methods explained in the book are first applied to an "example ship." Then a "problem" ship different from the one just mentioned, is worked through so that the student may get a good grasp of the entire process.

Selected Projects and Teaching Procedures

Thirty loose-leaf pages, 8½ by 11 in. Price, 55 cents. Published by The Manual Arts Press, Peoria, Ill.

This is the 1941 collection, and contains working drawings and directions for making 14 different projects. Two of them are of metal, the rest of wood.

Exploring the Graphic Arts

By Anthony Marinaccio and Burl N. Osburn. Cloth, 274 pages, 6⅛ x 9¼ in., illustrated. Price, $2.50. Published by International Textbook Company, Scranton, Pa.

A book on fundamental techniques common to the graphic arts. Both hand and machine operations are covered.

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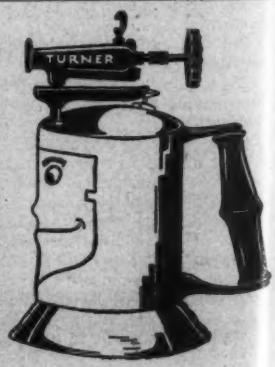

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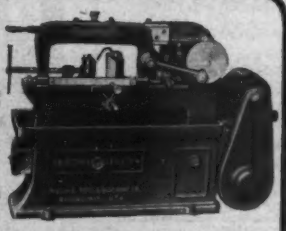

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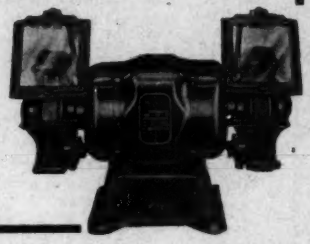

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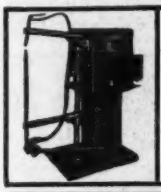

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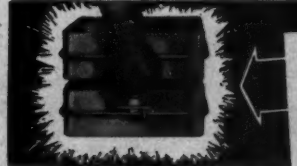

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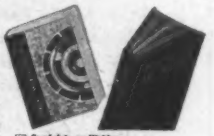

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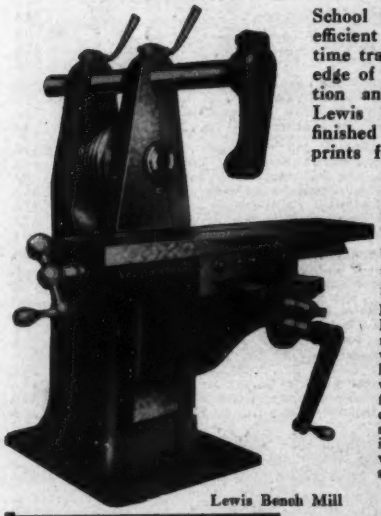

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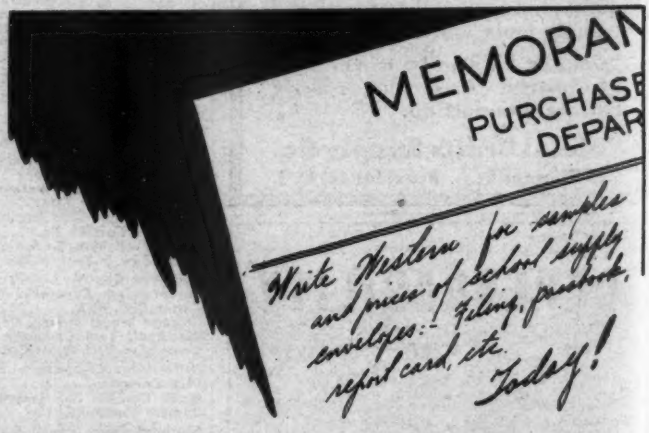

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